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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXI NO. 12

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IT IS DIFFICULT TO SURPASS NATURE'S TRIMMING

Better Crops with PLANT FOOD

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VOL. XXXI WASHINGTON, D. C., DECEMBER 1947 No. 12

Best wishes are . . .

Yours for Yuletide

Jeff McDermid

FOR OVER TWENTY YEARS I've paid my respects to Christmas through these friendly columns, and paid my obligations to that hearty holiday in the usual family and community ways. Here we are again, ready to renew those pleasant relations. We've all come a long way since 1927, and many of us possess hair of a lighter hue (what there is of it) than we smoothed with those handy Christmas brush-and-comb sets that kids gave their Dads in holiday remembrance. In that precious interval of two decades we all have made new friends and lost some old ones; raised "Ned" and a few children; acquired good experience, a little leisure, a dash of conservatism to quell our egotism; and obtained some detachable teeth, those indispensable spectacles, and the early frostbite of rheumatism. Yet, no doubt the items we have gained meanwhile far outweigh the powers and privileges we have lost.

In those earlier essays it was customary to regard Christmas as a season pre-empted and claimed for infants and youth, so that the sharing of juvenile joys dictated most of those former sentiments. As one grows apace in years and finds weakness and frustration the common lot of elder observers, it seems a bit forced and artificial to indulge in the vivid and carefree Christmas outlook which comes so naturally to those of tender years, bright hopes, and boundless energy.

One wishes at such festive, soulful seasons to regain and re-live the pleasures of the times without regret and without reproach. To put it a bit more in metaphor, you long to be forever

green and growing like the needles of a pine amid the cheer, rather than to wither and fade like a leaf on a deciduous tree whose brief term of usefulness is past.

Probably the best way to achieve this self-hypnotism is to quit looking at the rising generations behind you with envy and gaze instead at folks existing in the ancient decades of life, whose behavior is either an inspiration or a warning. Looking at the feeble, who are apt to be forgetful and forgotten, one chooses to keep the mind and memory clear rather than to scan old scrapbooks for plaudits of ancient triumphs in an era that has ended.

Anyone who has taught, performed, or written for the people of his time must remain forever an observer, a student, and an interpreter. Happiest and most serene during his slightly downward journey on the train of time is he who can forget the bumps and jars of travel by searching familiar passing scenery for ambitious new improvements and flashes of the rainbow-colored dreams he noted there so eagerly of yore.

New faces and old incidents are not contradictory. Old plans and new ones have much in common. Old ways of saying kindly things will never change in spite of unfamiliar styles and modern marvels.

WITH THIS IDEA uppermost, I'd like to say again some of the things expressed before—taking just a rambling retrospect through idle thoughts of other Yuletides. Unlike Brother Webster with his dictionary, I've tried not to make them entirely disconnected reading.

Figments of fancy woven therein represent the best it is possible for me to conjure up, no matter how hard my efforts are or how anxious I am to outdo my own limited levels of expression. You say a thing one way, which is the best way it seems to you, and any further attempt to doll it up or punch it into better molds is taking pains in vain.

Age and changing custom and law and regulations have combined to sift out the original American spirit from some calendared occasions. But December's feast days stay the same. We can insult our souls and stultify every other holiday without much risk, but when one flaunts Santa, he's ready for the sanitarium.

I DO NOT KNOW who invented Christmas in the first place—maybe a sorrowful bunch of emaciated victims of Roman terrorism, or a few jolly priests in the Alpine valleys on the Austrian Tyrol; or perhaps rotund Saxon barons bringing in the boar's head for a round of reckless gormandizing. It makes little difference who plotted the idea, it survives and withstands every adverse current from Metternich to Mussolini and from the Huns to Hitler. No other date is so defiant of disaster.

After you have sat with your wife before the glowing hearth, surmounted by its holly fringe and row of hopeful hosiery, listening to carolers along some distant street, you are not so apt to blame the world for its sins as you are to thank it for its charity.

You recall that when we were very young the uplift of the holidays came to us largely because of delightful mystery and great personal expectations. Prior to my tenth year I had implicit faith in the jingling journeys of the snowy saint and did not allow mere physical improbabilities to shake my confidence. I may have wondered why Santa brought me the same kind of sugar cookies cut with the crinkly tins I saw my Mother use, or why some of his packages bore trade labels from Arthur & Johnson's when the North Pole factory was considered the source of all his benevolence. Even when at Sunday school gift night I caught our local blacksmith stuffing his muscular anatomy into a red suit trimmed with white braid and having facial trouble with adjustable whiskers—even then I rebelled against growing unbelief.

Then came the time when we put on long pants and had socks too short for Santa, when our voices were changing, when we got into grammar school and the fifth ward gang and fed on Cooper, Henty, Cap Merrywether, and Robert Louis Stevenson. We knew all there was to know and much more that couldn't be repeated. We were proud of black eyes and grubby knuckles but ashamed of report cards or a poor catch "at first."

Ranging afield with air gun and fish pole, pockets bulging with artful barter,

chummy with freckled boys of no ancestry, and followed by yellow dogs of no pedigree—that was the age of independence and of nonchalance, a time when Christmas took a back seat for awhile. One could well be a little sorry for that kid, because he had so much faith in himself and the world of destiny and opportunity, and a lot of such stuff harder to swallow even than Santa Claus. He thought he was renouncing fairy tales. He wasn't hanging up "no socks no more." He was out to hang up a record!

In the next stage of life, the boy meets the girl of his choice. Thereupon old Christmas ideas crept back to warm his heart and tax his meager resources in trying to match the bewildering "for her" suggestions with his modest stipend.

Then the first Christmas eve spent with the first baby marks another epoch among those cherished moments. There was not always so very much left over to make merry with—but at least you were not knocking at somebody's overcrowded inn, and your credit with the milkman was good enough for a small but vital discount. Later on, as the tots became toddlers, you assumed the secret role of Santa yourself, just as your Father had done with much less to do with. Sometimes you slipped aside at the toy counter to count your change against furtive purchases, doubtful of their practical worth, but certain of their being cheerfully acknowledged and quickly smashed.

Those indeed, as you recall, were the days of rancid cigars, wrinkled neckties, no-go wrist watches, and cheap perfumery. But you passed it off by thinking that, after all, the beautiful gifts pictured in the de luxe magazines were not meant for a subordinate clerk with two babies, a hopeful wife, a yawning furnace, and a hefty mortgage. It was a time for slaying economic dragons with just a moment or two of Christmas mirth. So you took it in mighty measure, up there in the tiny flat or maybe on the rented farm. You forgot the dreams of fish-pole days and settled down in earnest to face the world as it came along, sure of the helpful handclasp of the finest little Mary since the Time of the Manger.

SO THEN it was we said: "Come, my friends, smuggle those mysterious bundles into the house through back door or cellar window; hide them in locked drawers or leave them awhile at the neighbor's until the hour arrives when the little tree shall be trimmed and the inquisitive children unwillingly shall be forced into bed. Tune on the radio to make Christmas carols loud enough to muffle the rattling of the paper parcels or the squeaking of toy dogs, while you are busy doing the honors awaited by expectant ones.

"Stoke the fire again, wind the clock, pat the lumpy stockings as they hang there in the ghostly firelight, count your limping bank balance once more, and then go heave yourself on the mattress. You won't need to set the alarm clock

(*Turn to page* 49)

Fig. 1. This field is typical of many in which poor aeration was induced by compacted soils, the result of working the soil while too wet last spring. Roots were severely rotted. Midwest, 1947.

Soil Aeration and Crop Response To Fertilizers—1947

By G. N. Hoffer

Lafayette, Indiana

CORN PLANTS on thousands of acres in the Midwest failed to respond to fertilizers this past summer—1947—because compacted soils prevented the roots of the plants from functioning efficiently. Many tons of fertilizers, applied either in small amounts in the hill or row, or in large quantities plowed under, were unused by the plants. Figure 1 shows the condition of the plants in many fertilized fields at the end of the growing season. The roots were severely rotted, the plants lodged, and poorly developed ears resulted.

The spring weather generally was cool and continued wet through the customary time for preparing the soil for corn. Growers became over anxious and worked their soils while too wet. Their usual operations of discing, plowing, planting, and cultivating compacted the wet soils. Many of the compacted zones were even deeper

than the usual plow depths. The non-capillary pore spaces were reduced and this condition affected the drainage and aeration characteristics of the soils during the entire summer.

Field studies during the latter part of the summer revealed the startling fact that the crop rotations used to produce large volumes of cash crops during the war period, corn and soybeans mostly, had not maintained the necessary amounts of organic materials deep enough in these clay soils to prevent these difficulties.

High yields of corn under these climatic conditions were obtained invariably in those fields in which good stands of alfalfa or sweet clover in the rotation had kept the soils in good tilth. The purpose of this article is to feature the advantages of using deep-rooted legumes in Midwestern crop rotations to maintain the soil aeration conditions needed by healthy plants in order to use fertilizers efficiently and produce high yields. It is hoped that the field diagnoses of the different case histories briefly reported in this paper will stimulate more interest in these important soil-crop interrelationships.

Taprooted Legumes vs Corn Acreages

The need for more taprooted legumes to maintain better soil tilth is reflected in Table I which shows the relative number of acres of alfalfa and sweet clover in comparison to the acres of corn grown in each of the Midwestern States. The states are listed according to the widest ratios. The data are taken from the 1946 acreages in the U. S. Department of Agriculture Crops and Markets, January 1947 issue.

Interesting is the fact that the poorest corn fields due to the wet soil compactions were found in the states with the widest ratios.

Fibrous-rooted Legumes

The fibrous-rooted legumes—red clover, alsike, Ladino, soybeans, and others—along with grasses, such as brome, orchard, blue, and timothy, maintain good soil tilth when well fertilized. However, some cases of clover-grass pastures were found this summer with the soil compacted by grazing animals. Such pastures usually were in distress because of deficient fertility as well as sub-surface compactions. The fibrous-rooted legumes will supply organic matter when plowed under but this favors chiefly the topsoil. Yet in soils with compacted zones below the plow depth these fibrous-rooted legumes with their shallow roots limited mostly to the aerated topsoil may respond well to fertilizers. None thrive in soils that are wet for extended periods.

TABLE I. RATIO: ACREAGES OF ALFALFA AND SWEET CLOVER TO CORN—Midwestern States—1946

State	Ratio—Acreage Deep-rooted legumes to Corn
Illinois	1–16.1
Missouri	1–15.2
Iowa	1–14.2
Indiana	1–10.4
Kentucky	1– 8.5
Ohio	1– 8.1
Minnesota	1– 5.2
Wisconsin	1– 2.9
Michigan	1– 1.6

Taproots

The chief value of alfalfa and sweet clover is that they produce taproots, the growth of which is directed straight downward by gravity. This is the same influence in reverse that guides the upright parallel growth of all straight evergreen trees irrespective of the slope of the land. The taproots of the legumes have great penetrative powers when the plants are well supplied with plant nutrients, such as potash, phosphorus, calcium, and magnesium and will push deeply into compacted soils. There are many references in the literature on this subject. Our particular interest, however, resides in their ability to provide the organic

materials to keep soil particles aggregated to a depth of from 6 to 18 inches, as shown in Fig. 2. In this respect the taprooted legumes have distinct advantages over the fibrous-rooted legumes in improving soil structure and tilth. Corn crops definitely respond to fertilizers better when the taprooted legumes precede them in the rotation.

The taproots shown in Fig. 2 were in a field at the C. M. Hobbs and Sons Nurseries, Bridgeport, Indiana. For years this company was attempting to use heavily fertilized soybeans, plowed under, to improve the soil tilth in their nursery fields. Soil profile samples revealed a tight soil immediately below the plow depth in these fields. During 1946 and 1947 sweet clover was planted and the improvement in the soil structure is shown in Fig. 2. Sample tube No. 1 is from a plot with soybeans plowed under. Note tight soil below plow depth. Numbers 2 and 3 show the effect of the sweet clover roots in improving the soil tilth after the first full year of growth. These taproots yield decomposition products with soil-aggregating properties when the plants are clipped and plowed under in the fall of the first season. If they are allowed to grow the second year the plants use up the energy materials stored in the taproots to produce the new growth. The old roots then become carbon carcasses of lesser value in improving the soil texture. Note the decayed roots of a second year plant in Fig. 2. Tissue tests on these roots reveal practically no mineral nutrients left in them.

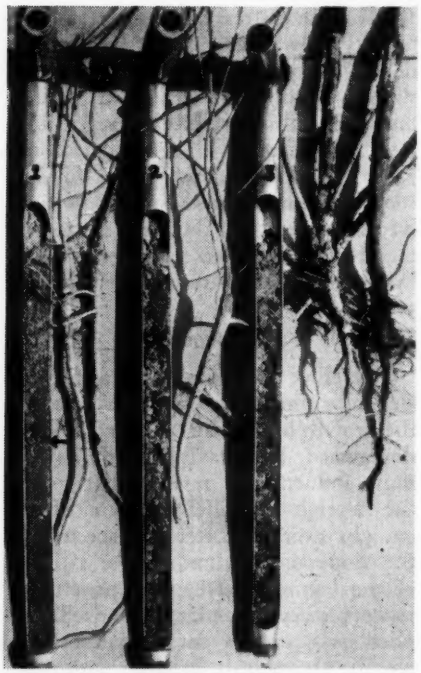

Fig. 2. Soil samples and taproots of sweet clover plants, C. M. Hobbs and Sons Nursery, Bridgeport, Indiana. No. 1 shows compacted soil below plow depth—soybeans were plowed under. Nos. 2 and 3 show effects of one-year sweet clover growth plowed under. Note improved soil tilth in 2 and 3.

Figure 3 shows the relative growths of eight-month-old alfalfa, red clover, and sweet clover seeded together in a pasture last spring. These plants were taken from about a square foot of Drummer soil on the farm of William Ross, Kentland, Indiana. At seeding time 500 lbs. of 0-10-20 per acre were applied. Observe the deeper penetration of the sweet clover roots when growing in competition with alfalfa and red clover. Various reports indicate that the soil aggregation and tilth improvement from the growth of one year of a good sweet clover crop are equal to that from two years of alfalfa.

The chief objection to sweet clover is the difficulty of getting a good stand due to the weevil which destroys the very young plants. C. V. Conder, Manager of the Triangle Farm Management Company, Inc., Sheldon, Illinois overcame this trouble by dusting five per cent DDT from an airplane over 400 acres of sweet clover just when the young plants were emerging this spring. He obtained excellent results and is planning additional acreages of this tilth-improving crop in 1948. Sweet clover and alfalfa are important crops in all of Conder's soil management programs.

Let us consider several typical cases

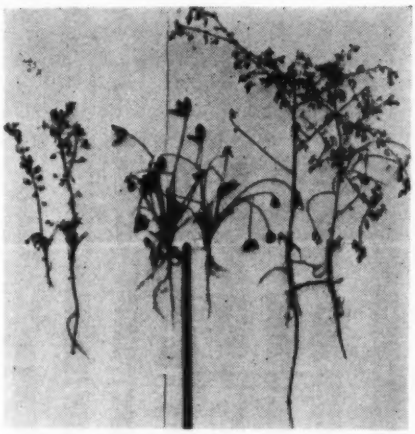

Fig. 3. Comparison of alfalfa, red clover, and sweet clover growths in same field after eight months. Wm. Ross Farm, Kentland, Indiana. 1947.

where soil compactions have affected adversely the growth of both fertilized corn and soybean crops.

Soil Conditions on Farm of Wm. Ross, Kentland, Indiana

In 1946, William Ross requested an inspection of his field of Lincoln soybeans that had been well fertilized but in September was not looking as well as expected. He had applied 400 lbs. of 3-12-12 to the beans at planting time to guarantee a good yield. Soil samples were taken in this field and it was found that the soybean plants were growing in a soil with about a 2-inch compaction just below the plow depth. Samples for comparative studies were taken also from a virgin sod, a fence row, and from a field in which corn was grown three consecutive years. Figure 4 shows these soil samples. Observe the compacted layers in Nos. 1, 3, and 4. These samples were from the field of Lincoln soybeans, while No. 2 was obtained in a close-by fence row. The compactions obviously were the result of poor soil management during a series of corn and soybean rotations in this field. The soil was a heavy clay loam—(Drummer, Parr, and Corwin soil types).

Sample 5 was from another soybean field on this farm—the first crop ever grown in this field. The sod was plowed in 1946 and the soil profile shows a slightly compacted zone just below the plowed-under organic matter. This compaction apparently is due to the plow-sole pressure which formed a thin tight layer of soil against which the finer silt and clay particles accumulated later by eluviation processes following the discing or plowing operations. Examples are shown in samples 1, 3, and 4.

Profiles 7 and 8 show the condition of the soil in a field where Mr. Ross had grown hybrid seed corn for three successive years. Number 7 was taken between the corn rows and shows the soil compacted to plow depth due to cultivation machinery. Number 8 shows a deeper compaction to 10 inches resulting from the weight of a detasseling machine operating 10 successive days during wet weather.

These samples shown in Fig. 4 were

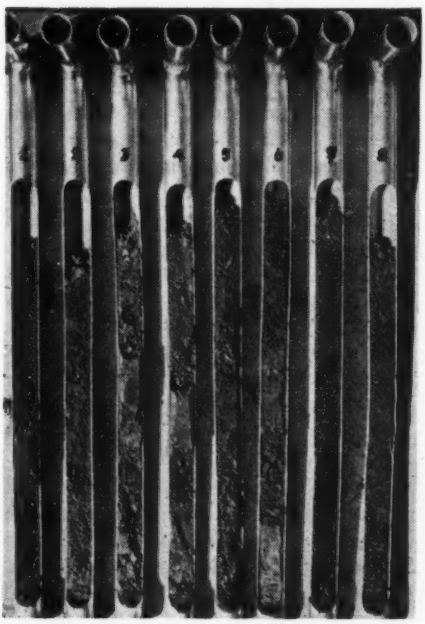

Fig. 4. Soils from Wm. Ross Farm, Kentland, Indiana, 1946: Nos. 1, 3, and 4 from soybean field; No. 2 from adjacent fence row; Nos. 5 and 6, virgin sod; Nos. 7 and 8, third year corn. Note fine silt accumulation in Nos. 1, 3, and 4; and pressure compactions in Nos. 7 and 8.

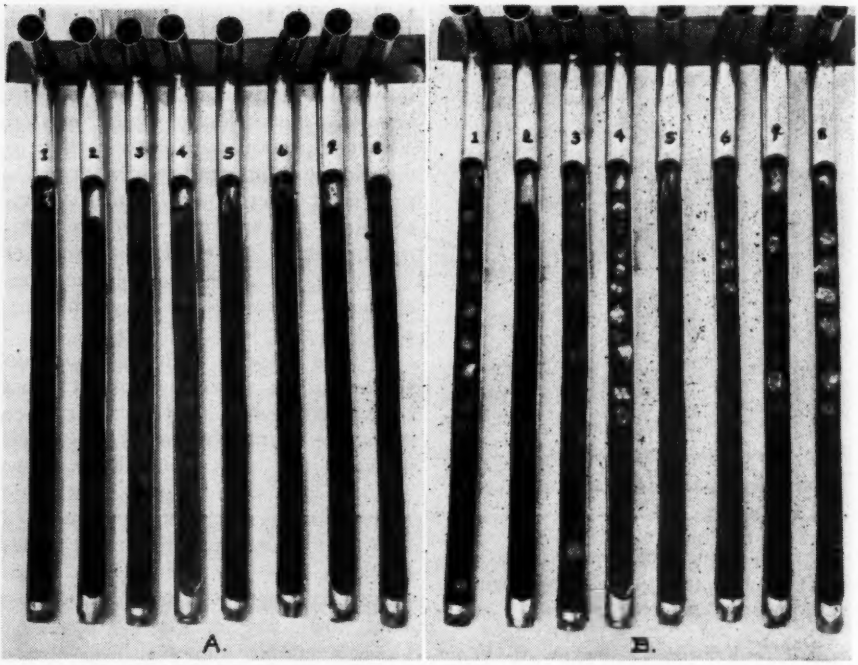

Fig. 5. (A), (B) Soils from Wm. Ross Farm, Kentland, Indiana, 1947. (A) Samples from same fields as shown in Fig. 4. Soybean field—Nos. 1, 3, and 4 had been deeply disced; No. 2, fence row; No. 5, virgin sod; No. 6, in oats; Nos. 7 and 8, fourth year corn. (B) Shows results of chalk-porosity tests—same soils as in (A).

used also to determine the acidity, available phosphorus, and potash at different levels in order to plan some experiments on soil improvement on this farm. This year, 1947, the field represented by soil samples 1, 3, and 4, was deeply disced, fertilized with 500 lbs. 0-10-20, and seeded to sweet clover, red clover, and alfalfa in early spring. Number 5 was seeded to oats. Field represented by Nos. 7 and 8 was disced deeply and planted to corn the fourth straight year.

Porosity — Chalk Tests

Figure 5-A shows samples of soil from the same fields in 1947 as shown in Fig. 4. These samples were taken September 15. Many interesting observations were made. Tests for soil compactions were made on the samples showing the white blotches—Fig. 5-B. The soils in the samples to the left (A) were tested for infiltration and porosity differences from the top to the bottom by dropping onto them a water-suspension of precipitated chalk. The reasoning to support this test is as follows: When soils are in good tilth, the non-capillary pore spaces will allow the small particles of precipitated chalk to enter the soil freely. When the soil is compacted, the soil pores will absorb the water but prevent the chalk particles from entering. A quick demonstration of zonal compactions is made by this test. (The test solution is prepared by adding two level teaspoonfuls of U.S.P. Precipitated Chalk to two ounces of distilled or rain water in a dropping bottle. Shake well each time before using and apply one, two, or three drops as needed to show the pore space differences.)

Now refer to Fig. 5-B and see what happened during the year in the fields tested. The compacted layers shown in Nos. 1, 3, and 4 in Fig. 4, were displaced by deep discing. Compare these with same numbered samples in Fig.

5-A. This field had been seeded to sweet clover, alfalfa, and red clover. In September the soil was still relatively tight below the plow depth as shown by the porosity-chalk tests, Fig. 5-B. Number 3 was in fair condition; No. 1 was fairly good to plow depth, but still showed a slight compaction at plow depth. After these legumes grow another season a series of samples again will be taken for further study. Number 2 sample from the fence row showed excellent tilth characteristics when tested. Observe that the chalk was absorbed at all levels.

Number 5 was from the virgin sod field samples as No. 6 in Fig. 4 in 1946. The tilth-porosity was excellent. Number 6 sample was from the No. 5, 1946 field. After two crops, soybeans in 1946 and oats in 1947, the soil is showing some compaction in the plow depth zone. The soil in this field will be watched closely to observe whether or not the continued pulverization of the soil by the friction equipment—rubber tires, discs, plows, and cultivators—will form by eluviation processes compactions similar to those shown in Fig. 4, samples 1, 3, and 4. These dense soil zones consist of very fine silt and clay particles. Hardpans, plowsoles, and claypans affect the aeration, infiltration, topsoil saturation, and erosion control measures. Eventually the soil physicists may prescribe when, where, and how much fertilizer should be used for crops in these compaction-susceptible soils.

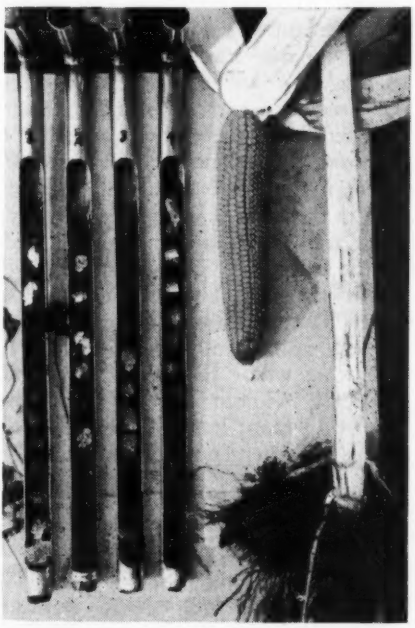

Fig. 6. Soils from Otis Wall Farm, Advance, Indiana, 1947. Nos. 1 and 2 show compacted sub-surface soil in Ladino-brome grass pasture; Nos. 3 and 4, from corn field; No. 3, in corn row; No. 4, between corn rows.

Refer again to Fig. 5-B, Samples No. 7 and 8. The corn plants in this field were growing under tight soil conditions similar to those in many areas in the Midwest this year. Note that the soil in this field was compacted by pressure to and below the plow depth. Weak and shallow root systems characterized the plants in this field. The future soil-management program for this field brings well-fertilized, deep-rooted legumes into the rotation in 1948. All of the fields on this farm will be studied during the next several rotations.

Ladino Pasture Problem

Ladino clover is proving to be an excellent crop, when fertilized, for pastures in Indiana, but when used in a rotation with corn its tilth-promoting ability is not too good. This is the case on the farms of Otis Wall, Advance, Indiana. Mr. Wall feeds thousands of lambs on his farms each year and has used Ladino, alfalfa, and brome in his pastures. These pastures are rotated with corn. The corn is always left standing and used for feed for other livestock during the winter.

The heavily fertilized Ladino clover crowds out the alfalfa in Mr. Wall's pastures, but with brome grass it should have kept the soil tilth in better condition. During the past summer tests were made on the soil in these pastures and corn fields. Although in rotation with this legume and side-

Fig. 7. Comparison of soils and corn plants from adjacent fields: No. 1 from field following red clover pasture; No. 2 from field following 3 years alfalfa. Note compacted soil to plow depth in No. 1 and good soil porosity in No. 2. The corn roots in No. 1 were rotted and many plants had lodged.

dressed with nitrogen fertilizers, the corn crops still showed nitrogen deficiency symptoms which were attributed to dry weather.

The soil profiles in Fig. 6 tell the story. The chalk-porosity tests were made on two samples: (1) and (2) from the pasture fields, and (3) and (4) from one of the corn fields. Note the compacted soil near the surface in (1); deeper in (2). Below these compactions the infiltration to the subsoil was good. Samples (3) and (4) were taken from the corn field; (3) in the row and (4) between the rows. The topsoil in (3) was pushed into the corn row while cultivating and served well for the brace roots of the plants to feed in. Below, the soil was tight and similar to that shown in (4). Mr. Wall is satisfied that the Ladino, brome, and some scattered alfalfa plants in his heavily pastured fields are not maintaining satisfactorily the tilth for corn plants, in spite of heavy amounts of fertilizers used. Plant tissue tests for phosphates and potash showed ample supplies of both in the pasture plants.

The profile studies indicated that opening the soil with straight discs was needed to correct the near-surface compactions in the pastures and that a deep-rooted legume should precede the corn crops on this farm, particularly in those fields where the porosity-chalk tests show an immediate need for the improved tilth below the plow depth. Mr. Wall admitted that his father had used sweet clover for this purpose years ago. This is just another case where the use of lime and fertilizers without the proper tilth-improving crops has not measured up to the requirements for maintaining good tilth for satisfactory corn production.

Corn Following Alfalfa and Red Clover

An interesting comparison between adjacent fields of corn was made while on a field trip with Dr. Fred Boyd,

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Pasturing Cattle in Tung Orchards

By Harold Severson

Evanston, Illinois

THE transformation of cutover pineland in Louisiana and Mississippi into great tung orchards covering hundreds and thousands of acres constitutes one of the South's great agricultural success stories. It was made possible by the discovery that tung trees could be grown profitably in the extreme lower part of the South on the right kind of soil—if given the right kind of attention.

The tung belt begins near Beaumont, Texas, and extends eastward along the Gulf Coast into northern Florida. It is approximately 100 miles wide. About half of America's tung fruit is grown in Pearl River County, Mississippi, with most of the production concentrated within a 100-mile radius of Bogalusa, a small city just across the line in Louisiana.

One of the biggest orchards is owned by C. W. Goodyear of Money Hill Plantation near Bogalusa and comprises about 6,000 acres. The Bogalusa Tung Corporation, a British concern, has about 7,000 acres. L. O. Crosby, Sr., located at Picayune, Mississippi, has around 5,000 acres of his own and supervises another 35,000 acres. Smaller orchards scale all the way from 1,000 acres down to an acre or two. Most of the little groves are found near Cairo, Georgia, where farmers often sell from $300 to $500 worth of nuts from their so-called fence-row plantings.

Now that the reckless promotional phase of the tung industry of the '30s, an era when speculators sold orchard sites at exorbitant prices, is only an unhappy memory, most of the orchards are owned by people willing to pay for upkeep of the groves. This includes pruning, fertilizing, and terracing. Cutover land is relatively cheap, but from $30 to $50 must be paid out for each acre in order to blast out and haul away stumps, terrace the slopes, and get the trees planted and fertilized.

Generally speaking, the right soil is one with a considerable amount of clay in it. The tung prefers slightly acid, rolling land that is easily drained. Hillsides, when properly terraced and fertilized, are quite satisfactory.

Use of Cover Crops

The cornerstone of success in the tung-growing business is use of cover crops. As a result, more and more orchardists are getting several crops from their orchards each year—tung nuts, beef, milk, and hay. The milk and beef are the result of planting good legumes between the trees for herds of dairy and beef cattle. The herds in many cases pay the cost of both cattle and tung production, according to County Agent J. M. Sinclair of Poplarville, Mississippi. That leaves the proceeds from the tung crop as a net profit.

One cattleman-orchardist who operates to good advantage in this manner is M. P. Clark of Pearl River County. His herd of purebred white-face cattle grazes 12 months of the year in his orchards, receiving no supplemental feeds except minerals. Yet the cattle

are sold for highest prices on the New Orleans market.

In conjunction with the orchard grazing, most cattlemen also establish a permanent pasture consisting of Dallas grass for spring grazing and common lespedeza for fall grazing. By running a disk over them every three or four years, the pastures are brought to new life. Generous applications of basic slag or phosphate and lime together with potash are highly desirable.

In most cases, cattle are turned loose in winter on Singletary (also known as Caley or Wild winter) peas. This winter legume reseeds itself and makes an excellent cover crop. The drawback to grazing of Singletary peas is that the livestock must be removed from the orchard just as soon as the peas come into bloom to avoid the possibility of the stock being poisoned. Alyce clover, a sensational newcomer to the South's legume field, is used as a summer grazing and hay crop and also as an erosion preventive and soil builder.

Other Clovers and Legumes

Other winter clovers and legumes used in the tung orchards include White Dutch clover, vetch, and crimson clover. County Agent Sinclair recommends using White Dutch clover and/or crimson clover in pastures that are kept separate from Singletary peas and common vetch. In this way the two clovers reseed about the same time while the vetch and peas reseed about the same time, too. Neither interferes with the other in growth and grazing period.

Intermedia Crotalaria is used along with Alyce clover for summer grazing, the orchardists being careful to keep them in separate grazing plots. They usually prepare their seedbeds in May, breaking the land and disking in the minerals and fertilizers. The legumes are planted between May 15 and July 1, with June 1 as the preferred date. By August 1 these crops are ready to be grazed and are pastured until killing frosts occur. This is usually the third week in November down in Pearl River County. Just to be on the safe side, most orchardists remove the cattle in October and place them on the permanent pasture, giving the Alyce clover and Crotalaria a chance to reseed. In addition, this affords the vetch, peas, and White Dutch or crimson clover an opportunity to germinate and establish a stand during the absence of the cattle.

The Mississippi Extension Service has been conducting a 10-year demonstration on Pearl River County tung farms with the idea of developing a year-round grazing program. As a result, sleek herds of dairy and beef cattle may be found in almost every orchard in St. Tammany and Washington Parishes and Pearl River County. Marshall Ballard, Jr., of Lumberton, Mississippi, has found sheep grazing in tung orchards a very profitable enterprise. County Agent Sinclair says that his 167 dairy farmers in the county are learning that Alyce clover in tung orchards during the summer months is a good crop for conditioning cattle in the fall and thus getting them in good shape for winter.

The White Dutch and crimson clover should be planted between October 15 and November 15 on the Crotalaria stubble or sod. It germinates and is ready for grazing by January 15 to February 1—in some cases at a much earlier date. Singletary peas and vetch may be planted at the same time and will be ready to graze by December 1 through December, January, February, and March.

Additional Recommendations

To guard against any eventuality, County Agent Sinclair is recommending to orchardists that they plant about one-half acre of oats for each animal. That means 50 acres of oats for a 100-cow herd. The oats are planted in either August or September on well-prepared and fertilized ground and can be used for a catch crop to provide

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The Management of Mint Soils

By W. L. Powers

Soils Department, Oregon State College, Corvallis, Oregon

PEPPERMINT has been cultivated in northern Indiana and southern Michigan for more than 100 years, and in western Oregon for some 40 years. The English or black variety is generally grown and is known botanically as *Mentha piperita.* Mint is a cash crop that can be grown with rather extensive methods. Under wartime prices the plantings expanded in Oregon to some 9,000 acres which produced 44 pounds of oil an acre or 396,000 pounds in 1946, worth approximately $3,000,000. This was nearly one-third of the nation's production, according to Professor H. H. White, Associate Extension Economist at Oregon State College.

The oil yield is higher here than in the Indiana-Michigan mint-growing area, and there is less frost, wind, or pest trouble thus far. The warm, late summer is favorable.

Mint Soils (Table 1) should be well drained yet moist, and should be mellow, well supplied with organic matter and fertility, and free from weeds. Peat and muck soils or recent alluvial lands of fine sandy loam to silt loam texture are suitable for this crop. Good yields have been obtained on soils varying in reaction from pH 4.8 to 7.3.

Fig. 1. Untreated mint (left) vs. Hi-potash complete fertilizer (right).

Culture

Planting stock is lifted from a pest-free field with a potato digger and

TABLE 1. CHARACTERISTICS OF MINT SOILS

Soil Type	Reaction value pH	Moisture equivalent %	Organic matter %	Total nitrogen %	Available phosphorus* Lbs./A.	Available K Lbs./A.
Labish Peat.....	5.6	92.9	78.4	1.556	40	100
Clatskanie muck.	4.8	77.1	58.9	1.190	30	50
Chehalis Si C L...	5.9	29.4	3.25	.162	75	180
Newberg F S L...	6.2	25.1	1.92	.128	120	150
Olympic Si C L..	5.4	27.9	3.40	.250	20	50

*Dets. by V. C. Bushnell.

Fig. 2. Untreated (left) vs. Hi-potash (right). Potash lessens lodging and shattering.

shaken free of soil with a fork. Planting is done in early spring by preparing and furrowing out as for potatoes. Fertilizer use will vary with soil, previous crop, season, and management. The roots are placed in a continuous line at about four inches' depth. Another method is to set young shoots a foot apart in three-foot rows, in May, with a Kale planter. Frequent harrowing and pasturing with sheep will control weeds until midseason, when some hoeing and hand-weeding are required and may run to 40 man-hours an acre.

Irrigation is desirable, unless for sub-

TABLE 2. MINT YIELD AND OIL CONTENT WITH DIFFERENT TREATMENTS

Lake Labish Peat

Farm Treatment and Lbs./A.	Green Hay Tons/A.	Oil Lbs./A.	Total Menthol %
Hayes:			
None	10.0	57.8	53.12
160 KCl + 10 T* M*	12.0	70.3	56.70
KCl + 100 $NaNO_3$	12.0	74.7	.....
N + 320 Ps* + KCl	11.5	54.1	.....
KCl	11.5	65.1	58.39
None	10.5	58.8	.....
160 K_2SO_4	14.0	91.9	.....
K_2SO_4 + 1 T $MgCa(CO_3)_2$	14.5	73.4	58.58
Herrold:			
None	1.28	13.6	53.12
160 KCl	7.36	76.2	58.39
80 KCl + 80 K_2SO_4	7.68	74.6	55.08
KCl + 10 T Manure	4.64	58.6	56.70
KCl + M + 1 T Lime	10.88	76.8	58.58

*M = Manure.
Ps = Superphosphate.
T = Tons.

Anal. by Dept. of Agr'l. Chem., O. S. C.

TABLE 3. MINT YIELDS WITH VARIOUS TREATMENTS

Clatskanie Muck

R. W. Nusom Farm—6-year average

Treatment and Lbs./A.	Mint Hay yield Tons/A.	Rel. to check av. 100	Total Menthol %
None	4.15	.....	
200 $Ca(NO_3)_2$ + 200 Pt*	4.60	107	
N + 120 KCl	5.71	135	
None	4.22	.....	
200 Pt + KCl	5.05	117	
N + Pt + 120 K	5.01	116	
None	5.39	.....	
N + Pt + 60 KCl	5.09	118	
N + P + 180 KCl	5.69	132	
None	4.42	.....	
Check Av.	4.31	100	
1 T Lime	5.28	120	
40 Borax	5.14	117	
None	4.40	.....	
40 $MnSO_4$	5.63	124	
2 yrs. only, 1/4 Acre plots			
200 KCl	4.44	96	50.91
200 K_2SO_4	4.97	107	53.46
None	4.66	.....	51.39
Mn + 40 Borax	4.80	104	51.62
100 lb. 16–20–0 + 200 K_2SO_4	4.81	104	54.18

*Pt = Double superphosphate.

irrigated peat land. Sprinklers are used to apply two to three inches' depth of irrigation each 10 to 15 days beginning about June 1. The depth per season with sprinklers has been found to average about 12 inches in Willamette Valley. With surface irrigation, as much as 24 inches' depth a season is used. Supplemental fertilizer of soluble material is applied through the sprinklers.

Harvesting

Harvesting is started when the plants are coming into full bloom and oil globules are numerous on the under side of the leaves. When the weather is dry and warm and mint comes into full bloom, the maximum amount of oil is contained. The period of blooming may extend over several days. If rains cause lodging and loss of lower leaves and oil globules, recovery will

Fig. 3. Leaf scorch (right) leads to shattering, but is prevented by potash as shown at left.

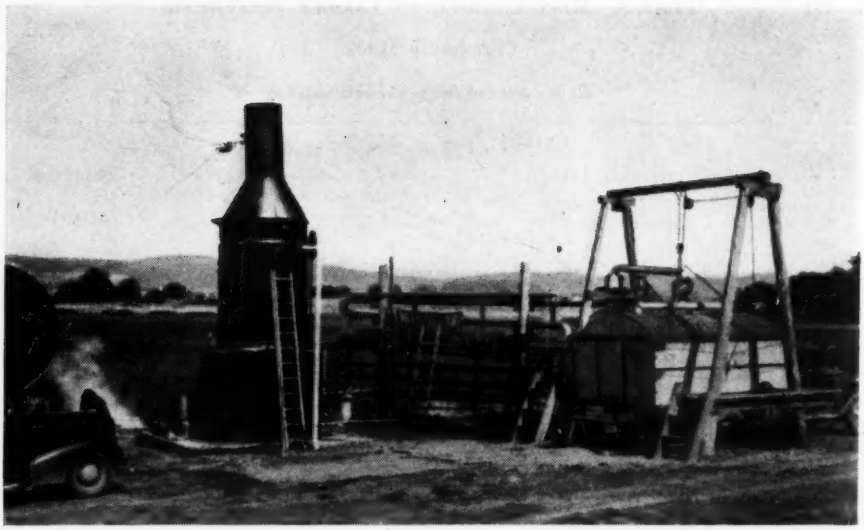

Fig. 4. Boiler; truck with tight bottom and insulated hood for distillation; condenser in rear.

be decreased. Leaf scorch from potash deficiency or insect injury to foliage may decrease yield (Fig. 1, 2, and 3).

Mint is cut with an ordinary mower and thrown by a side-delivery rake into a windrow to wilt. A hay loader is used to convey the crop to a truck with a tight floor. A recent trend is to have a steam coil on the truck bed with a channel at the edge of the bed for water seal (Fig. 4). An insulated hood is clamped down and coils connected to the steam line at the still. The hood is connected with a condenser. Mint straw is returned directly to the field for fertilizer or may be ensiled or dried for feed.

Response of Mint to Fertilizers

Fertilizer trials were initiated at Lake Labish by the Soils Department in 1928 at the request of growers who reported decline in yield and quality.[1] [2] A study has been made of soil, water, and nutrient requirements of mint in subsequent years in major mint-growing areas and is being continued. Hay yields are more readily secured than oil production from many fertilizer plots. The plan has been to get hay yields in all cases and then secure oil yields and analyses where definite growth response was found. Moisture determinations were usually made for samples of hay collected when test weights were made. Preliminary greenhouse trials simplified the field tests. Two or three replications have been provided in the field in most instances. Hay yields tend to parallel oil production or run near "a gallon of oil per ton." Heavy nitrate application in season and heavy irrigation tend to increase stem growth and decrease menthol. Phosphate tends to promote blooming and early maturity. Potash tends to prevent lodging and shattering and overcomes leaf scorch, premature defoliation, and loss of oil.

On Lake Labish peat (Table 2), several years' trials show that potassium sulphate increased CO_2 release, lowered the water requirement, approximately doubled the yield of hay and oil, and tended to improve oil quality as judged by chemical analyses. Menthol con-

[1] Powers, W. L. *Chemical Characteristics of peat, muck soils in Northwestern U. S.* Proc. 2nd Int. Cong. Soil Sci. 6:246-256. Pub. Moscow (1932).

[2] Powers, W. L., and Jones, J. S. *Peat Land, Fertilizers for Yield and Quality of Mint.* Soil Sci. Soc. Amer. 7:395-397. 1942.

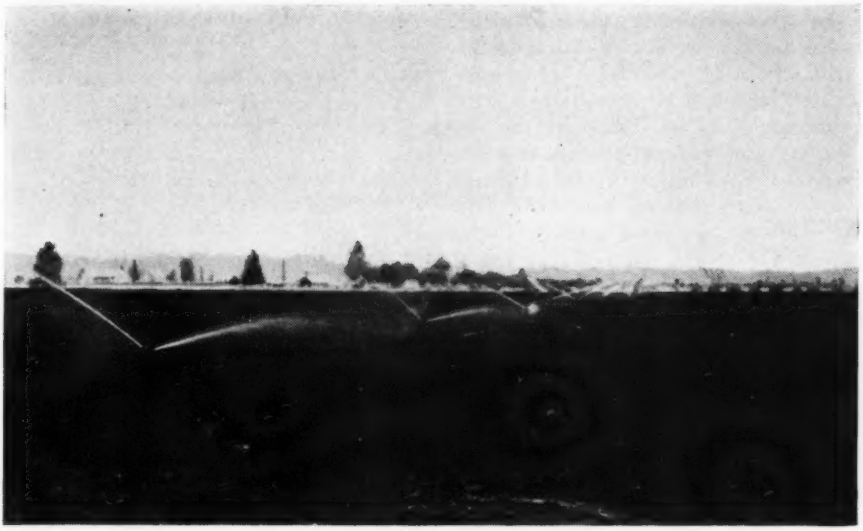

Fig. 5. Sprinkler irrigation of mint.

tent especially was increased. From 160 to 200 pounds of 50 per cent potassium sulphate was the economic rate of application. Lime and other major or minor elements gave small increases in yields.

On Clatskanie muck (Table 3), six years data indicate potassium chloride, 60 per cent K_2O, applied at the rate of 240 pounds an acre has been of major importance; yet inclusion of 100 pounds an acre of 16-20-0 has proven helpful (Fig. 1 and 2). Potassium has tended to improve menthol content.

Some increase in yield of hay has resulted there from inclusion of 40 pounds an acre of borax or manganese sulphate. Borax has tended to improve menthol content of the oil.

With Chehalis silty clay loam near Jefferson, 200 to 300 pounds an acre of 16-20-0 are commonly used; yet experiments show inclusion of 100 pounds an acre of 50 per cent sulphate of potash increased yields. On Newberg sandy loam, inclusion of potash and

TABLE 4. EFFECT OF FERTILIZER ON YIELD AND QUALITY OF MINT OIL

MINT	BARTRUFF		Olympic Si Cl L		
	1945		1946		
Plot Treatment Lbs./A.	Hay T/A. Baby Mint	Total Menthol %	Hay T/A.	Oil Lb./A.	Free Menthol %
300 lb. 16–20–0	2.00	63.84	5.12	46.0	54.73
16–20–0 + 240 KCl	2.60	63.21	5.02	30.0	54.28
Check	2.28	64.62	3.52	26.0	52.63
N–P–K + 40 lb. Borax	2.68	63.26	5.44	40.0	51.70
N–P–K + 40 lb. $CuCl_2$	2.68	58.45	10.24	52.0	50.50
N–P + 80 NH_4NO_3	2.56	59.26	10.34	48.0	50.52

boron gives definite increase in oil yield. Supplemental application through the sprinklers of 80 pounds of some soluble fertilizer such as ammonium nitrate is accomplished by dissolving the desired amount to be applied at one setting of the sprinklers in an oil drum from which a garden hose leads into the suction pipe just ahead of the pump (Fig. 5 and 6).

On Olympic silty clay (Table 4) near Lacomb, 100 pounds of 16-20-0 plus 240 pounds of 60 per cent potassium chloride, 40 pounds an acre each of borax and copper sulphate after plowing, and 80 pounds ammonium nitrate at the first irrigation have given largest hay yield. Menthol content on this soil ran high.

In general, potash fertilizer resulted in a marked increase in yield and tended to increase the quality of mint oil on peat and muck. On the Herrold field on Lake Labish, the increase was from 13.6 pounds oil untreated to 76.2 pounds with a pound per square rod of potassium chloride, or more than fivefold; on the Hayes field, from 57.8 tc 91.9, or 59 per cent increase. Increases from fertilizer on the Clatskanie muck have been general, with increases up to 43 per cent. On Newberg fine sandy loam, complete fertilizer with boron increased the yield 36 per cent, and on Olympic silty clay loam, 18 per cent.

If the information yielded by these experiments was applied in fertilizer practice, it should be possible to increase the present three million dollar crop by one-sixth, or a half million dollars a year.

Fertilizer and Mint Oil Quality

The yield of oil declines slightly after the full bloom while the per cent of menthol and esters continues to increase. Complete chemical analyses of several dozen oil samples from test plots show they generally meet government standards and show small differences, except in menthol. Formerly, menthol content was emphasized by purchasers. Buyers now emphasize aroma, taste, and color. Clean fields harvested in warm, dry weather at or near full bloom usually yield good quality oil. Blossoms are rich in oil and menthol. Perhaps contamination as from corroded condensers may be avoided by use of aluminum or other sheet metal.

TABLE 5. POTASSIUM CONTENT OF MINT LEAVES

Nusom Plots, Clatskanie, Determinations by L. K. Wood

Date Field Treatment	6–26–44 K%	9–8–44 K%
−K	2.100	0.800
None	2.166	1.127
Med. K	1.500	0.945
None	1.833	0.509
Lo K	2.100	0.364
Hi K	2.766	0.763
Hi K + Ca	2.700	1.200
Hi K + Mn	2.233	0.982
Hi K + B	3.166	2.400
None	1.700	0.545
Chartrey Plots		
−K	1.600	0.482
None	1.866	
Med. K	1.700	0.364
None	1.466	0.436
Lo K	1.033	0.364
Hi K	1.366	0.436
Hi K + Mn	1.900	
Hi K + B	1.833	
None		0.291
K variation none	1.833	0.593
K variation 240 KCl	1.666	0.556
K variation 120	1.333	0.593
K variation check		0.630
K variation 60	1.266	0.556
K variation B		0.630
K variation Mn		0.593
None—leaves separated		0.982
Hi K—leaves separated		1.500
None—blossoms		0.163
Hi K—blossoms		1.500
None—stems		3.527
Hi K—stems		0.581

Check "scorched leaves"	.22
100 lbs. 10-20-0	.22
" " 10-20-0 + 60 lbs. K_2SO_4	.44
" " 16-20-0 + 120 lbs. K_2SO_4	.67
" " 16-20-0 + 180 lbs. K_2SO_4	.91

Potassium Content of Mint

Some determinations of potassium in

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Fig. 1. A good crop of soybeans.

Do Soybeans Cause Clover Failures?

By F. A. Frank

Agricultural Experiment Station, Purdue University, Lafayette, Indiana

THE RAPID INCREASE of the soybean acreage in the United States during the last decade from about three million to approximately ten million acres has created new problems for the farmer, especially in the five Corn Belt states * where about 90 per cent of the crop is grown. While with adequate fertilization of the rotation and proper tillage methods soybeans have proven a valuable addition to the crop sequence on many Midwest farms, some farmers have experienced low yields or even failures of alfalfa and clover seeded in small grain following soybeans. Such losses must be considered serious and it is likely that soybeans, being a comparatively new crop, are often blamed for clover failures that are due to other causes.

Why Legume Seedings Fail

Legume seedings on soybean or any other cropland may fail for a wide variety of reasons, among which lack of plant food and lime and unsuitable soil preparation for and competition of the nurse or companion crop probably are the most prominent.

For instance Table I shows the removal of plant food by various crops. Obviously most legumes including soy-

* Indiana, Illinois, Ohio, Iowa, and Missouri.

TABLE I.[1]—PLANT-FOOD ELEMENTS ADDED OR REMOVED BY VARIOUS CROPS
(*Data compiled from various sources*)

Crop	Acre-yield	Nutrient elements per acre					
		Added N	Removed				
			N	P	K	Ca	Mg
		lbs.	*lbs.*	*lbs.*	*lbs.*	*lbs.*	*lbs.*
Corn	40 bu.	.....	40	7	8	.4	2.8
Oats	40 bu.	.....	26	4.5	6.5	.8	1.6
Wheat	25 bu.	.....	36	6	7.5	.5	2
Soybeans[a]	20 bu.	16	.....	8	25	2.8	3
Soybeans[b]	2¼ tons	.....	30	13	40	72	31
Alfalfa[b]	3 tons	.....	.....	13	96	120	24
Red clover[b]	2 tons	.....	.....	10	60	64	18

[a] Soybeans sold, straw returned. [b] Hay sold, no manure returned.
[1] See literature cited.

beans are heavy feeders of phosphate and potash and the deficiency of either or both essential elements can seriously affect stands and yields of clover.

Frequently soil acidity can be blamed for the lack of success with clover. Sweet clover and alfalfa are most sensitive to acid soil while red clover will sometimes grow on soils too acid for sweet clover. According to Table II most of our common legumes make their best growth just below the neutral point. Soybeans may still give fair results on medium acid soil (pH 5.6) which is not uncommon in the Midwest, but the yields of most other legumes fall off very sharply at that point.

With soybeans leaving the soil loose and friable, heavy seedbed preparation for subsequent small grains may sometimes cause the clover to be covered too deeply. Such practice can also make the seedbed liable to drying out, thereby interrupting the water supply for the legume seedling or the small plants.

One factor that definitely should not be overlooked is the competition of the companion crop. In all of the longtime crop-rotation tests which are discussed later in this article, small grains after soybeans have outyielded small grains after corn, and this experience has been confirmed by farmers throughout the Corn Belt. If the growth of the companion crop is very heavy, it can weaken or even kill legume stands by robbing them of moisture and plant-food nutrients or by shading or lodging. Quite obviously this danger will become greater with the expanded use of new heavier-yielding varieties of wheat and oats with stiffer straw and broader leaves.

In this connection the disposal and distribution of the straw of the combined small grain crop should be taken into consideration. Observations and tests in Indiana and Ohio have shown that heavy combined straw and stubble left undisturbed seriously injured clover and timothy stands on many farms.

There are many more causes for clover failures including the use of poor or unadapted seed, lack of inoculation, poor seeding methods, competition of weeds, and damage by insects or diseases. But those singled out in detail above may be especially serious if proper precautions are not taken.

Soybeans Benefit Subsequent Crops

A review of longtime crop-rotation experiments throughout Indiana shows

TABLE II.—RELATIVE YIELDS OF LEGUMES AT DIFFERENT SOIL REACTIONS SEVEN-YEAR AVERAGE, WOOSTER, OHIO [2]

Fertilizer treatment = 400 pounds of 20 per cent superphosphate and 50 pounds of muriate of potash per acre on the small grains in which the legumes were seeded. Lime was applied in varying amounts according to the reaction desired.

Relative average yields—highest yield equals 100

Soil reaction	Alfalfa	Sweet Clover	Medium Red Clover	Mammoth Red clover	Alsike Clover	Soybeans
pH						
4.6	3	0	16	17	14	67
5.0	9	2	30	30	28	79
5.6	41	44	58	67	74	78
6.8	100	90	100	100	100	100
7.7	99	100	98	91	94	95

that legume hay yields after soybeans have at least equalled those after corn. For instance, on mixed Brookston-Crosby silt loam soil the commonly called black and clay land of Central Indiana on the Soils and Crops Experiment Farm in Lafayette, the following average hay yields in pounds per acre were obtained during two periods, 12 and 13 years each.[3]

TABLE III.—CLOVER HAY YIELDS ON THE SOILS AND CROPS FARM, LAFAYETTE, IND.

Rotation	1916–1927 lbs./acre	1928–1940 lbs./acre
1. Corn, corn, wheat, clover	3,510	4,590
2. Corn, soybeans, wheat, clover	3,504	4,911
3. Corn, corn, soybeans, wheat, clover	3,462	5,014

In all these rotations manure was applied at the rate of 1,000 pounds per 1,000 pounds of produce removed, except the small grain. Wheat after corn was top-dressed with two tons of manure in winter while the rest of the manure produced by the rotation was plowed under for corn. Soybean straw was returned for the following wheat crop. Wheat received 200 pounds of 2-12-6 fertilizer and corn 100 pounds of 0-16-0 prior to 1936 when the analysis was changed to 0-12-12. In spite of the fact that the introduction of soybeans did not increase, but in case of Rotation 2 actually decreased the amount of plant food supplied per rotation, the hay yields in the rotations with soybeans compared favorably with those in the rotation without soybeans during the first period. In the second period hay yields in soybean rotations showed a definite increase over those in the corn rotation. Over the entire 25-year period wheat after soybeans averaged 33.6 bushels per acre while wheat following corn yielded only 27 bushels. Comparing the two periods in general it appears that crop yields cannot only be economically maintained but even substantially increased provided each rotation contains a legume at least once in five years and the crops are reasonably fertilized.

On the light-colored Plainfield fine sand of the Sand Experiment Field in Marshall County, a corn-tomato-wheat-hay rotation averaged 1,838 pounds hay per acre over the 10-year period from 1928 to 1938 as compared to 2,141 pounds of hay per acre in a corn-soybean-wheat-hay rotation.[4] In both rotations corn and wheat received 100 and 200 pounds of 3-12-12 respectively with an additional 16 pounds of nitrogen as

a spring top-dressing for wheat. Five hundred pounds of 3-12-12 were supplied to tomatoes, but only 200 pounds of 0-12-12 to soybeans. In spite of the lighter fertilization the rotation with soybeans outyielded the rotation without soybeans in both wheat and hay.

On the dark-colored acid Newton fine sandy loam of the Pinney Purdue Experiment Field in LaPorte County, the average yield of mixed hay for the period from 1925-1940 was 2,460 pounds per acre for the corn-corn-oats-mixed hay rotation and 2,575 pounds per acre for the corn-soybean-oats-mixed hay rotation.[5]

Small grain in these rotations received 300 pounds of 0-12-12 per acre and corn 100 pounds of 0-12-12 while soybeans received no fertilizer. Regardless of this disadvantage, the soybean rotation produced slightly more hay than the rotation with two corn crops.

In the southern part of the State, the hay yields on the Clermont silt loam of the Jennings County Experiment Field were 3,104 pounds per acre for the corn-wheat-clover rotation and 3,335 pounds for the corn-soybean-wheat-clover rotation. These yields are averaged for the period from 1922-1938.[6] All plots in this test received three tons of ground limestone per acre in 1921. Each corn crop received manure in an amount equal to the weight of produce removed during the previous round of the rotation except wheat grain. Fertilizer was applied at the rate of 100 pounds 0-12-6 per acre in the row for corn, 300 pounds 2-12-6 for wheat, and 200 pounds of 0-12-6 for soybeans.

In all these rotations manure and crop residues were returned to the land and enough commercial fertilizer was used to fully maintain the phosphorus supply and to replace some of the potash that was removed but not returned in manure. By following good farming practices the inclusion of soybeans in various rotations not only kept up soil fertility but proved beneficial by increasing subsequent grain and hay yields.

Special Experiments Show No Failures

However, continued reports of clover failures on soybean ground as compared with corn ground prompted several Agricultural Experiment Stations in the Midwest in recent years to study this particular problem. Only Willard and Thatcher of the Ohio Agricultural Experiment Station have published any actual experimental results lately.[7] In their tests they found with one exception no significant differences in the number of legume plants regardless of the preceding crop. In tests at Colum-

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TABLE IV.—RESULT OF PURDUE SOIL TESTS FOR SOME CLOVER EXPERIMENTS 1945-46

Cooperator	Crop preceding companion crop and legume	Fertilization	Avail. P_2O_5	Avail. K_2O
W. Gerke, Decatur	Corn	125 lbs. 0–12–12	very low	medium+
	Soybeans	.....	low	high
W. Hubenthal, Lucerne	Corn	200 lbs. 0–12–12	low	very low
	Soybeans	125 lbs. 0–12–12	low	low
F. Maxwell, Martinsville	Corn	100 lbs. 0–12–12	very low	medium
	Soybeans	.....	very low	low

Florida Grows Good Pasture on Coastal Plain Soils

By J. Francis Cooper

Agricultural Extension Service, Gainesville, Florida

PASTURES are growing greener than ever before in Florida and other Southeastern States. Research by the Florida Agricultural Experiment Station has helped materially in developing a pasture program which provides copious grazing and cheap feed over most of the year. During the last 15 years Florida cattlemen and farmers have established over 800,000 acres of improved pasture—more than had been put in during the 400 years since cattle first reached American shores on the ships of early Spanish explorers.

Pasture is now big business in Florida, where there is always a dearth of field crops for feed and where cattle have been an important agricultural enterprise for centuries. Improved grasses for summer, adapted clovers for winter, and proper methods of fertilization and management are now being employed throughout the State. Native wiregrass, which after burning provides good early spring grazing but soon becomes tough and unpalatable, is being replaced by the better grasses which furnish good grazing all summer.

Parade of the Grasses

Grasses now widely used for pasture development in Florida include Pangola, the Bahias, Coastal Bermuda, carpet, and Para. Others used to a certain extent include Dallis, cogon, Vasey, Torpedo (*Panicum repens*), and St. Augustine. The fescues, particularly Kentucky 31, are being tried.

The Bahias are especially adapted to higher lands, since their roots grow deep into the ground and will reach moisture in dry soils, but grow well on lower soils. Common Bahia was introduced by the U. S. Department of Agriculture and has been available for several years. Pensacola Bahia was discovered growing wild on vacant lots in Pensacola, Florida, several years ago by County Agent E. H. Finlayson. It has finer leaves than common, comes out early in spring and stays green late in fall, but has a tendency to become slightly tough during late summer. It seeds well and is being widely planted. Paraguay Bahia was introduced from Paraguay. It, too, has fine leaves, more hairy than those of Pensacola. The Bahias are seeded at the rate of 10 to 20 pounds per acre.

Coastal Bermuda and Bermuda No. 99 were developed at the Georgia Coastal Plain Experiment Station, Tifton. Like common Bermuda, both are perennials and develop underground runners. The new strains grow knee high or higher on good soils and can be mowed for hay. St. Lucie Bermuda has no underground runners and is grown on the muck and sandy muck soils underlaid with lime on Florida's lower East Coast. The Bermudas are best adapted to fertile soils not subject to flooding and are established by planting underground runners or stems.

Carpet grass, the old reliable, is adapted to moist soils, seeds bountifully, and is still the most common permanent pasture grass in Florida. It is low-growing on most soils but can be mowed for hay on more fertile lands. The rate of seeding is 10 pounds per acre.

Another new grass receiving much favorable attention is Pangola, introduced from Africa. Best adapted to moist soils, this perennial will grow also on well-drained lands, attaining a height of two to four feet. Producing palatable and nutritious herbage, it is one of the earliest of the improved grasses to make new growth in spring and stays green until frost. Plants, stems, and runners may be spread two to three feet apart in four-foot rows during April, May, and June and sprigged in or partially covered with dirt. Pangola can be scattered and disked in when moisture conditions are favorable. It should not be covered completely.

On the muck soils of southern Florida, where it grows from three to five feet tall, Para grass has attained considerable popularity. Established by spreading runners or mature stems and disking them in, it should not be grazed until it is around two to three feet tall. Rotational grazing and occasional diskings are desirable.

Cogon has attracted considerable attention for the "scrub" lands. It grows well even in dry sands. Its ability to spread by underground rootstalks and its persistency make it feared for crop lands.

Dallis grass needs a higher fertility level than carpet and the Bahias and is best suited to planting on muck soils and in combination with the clovers. It grows 25 to 50 inches tall. Seed produced in this country are subject to ergot disease and most seed are imported from Australia. Seeding is at the rate of 15 to 25 pounds per acre.

St. Augustine, a common lawn grass, has given outstanding results for pasture on the muck lands of the Florida Everglades. It furnishes more winter grazing there than Para. Since it does not produce seed, it is established by planting runners. Its companion lawn grass, centipede, should be kept out of pastures.

Vasey grass resembles Dallis, growing taller and more erect. Only a small quantity of commercial seed is available, but Vasey seeds prolifically along roadsides and railroads.

Torpedo grass, a sod-forming native perennial, has given a good account of itself. It has to be planted vegetatively.

Clovers Are Comers

Interest in clover has spread like a prairie wildfire in Florida during recent years and the research agronomists are beginning to obtain the answers to clover questions. First success obtained with clover in Florida came 10 to 15 years ago with White Dutch on moist lands. More recently Crimson has been growing up the hillside, especially on the clay hills of western Florida.

Principal things required for success with clovers are seed of strains adapted to growing in the Southeast and proper fertilization and liming.

For moist soils the Florida agronomists recommend White (or White Dutch), Hop, Black Medic, and others. For the higher lands Dixie Crimson or other Crimson known to have volunteered in the Southeast is outstanding. Hubam and annual yellow sweet clover grow on either fairly moist or fairly well-drained soils.

Most of the clovers, when planted alone, are seeded at the rate of 7 to 12 pounds per acre. When several are included in a mixture, the total seed for an acre usually runs 12 to 15 pounds.

Common, Kobe, and Tennessee 76 lespedezas furnish a desirable addition to the summer grazing in many pastures on clay soils or on moist sands. Like clover, they require lime, phosphate, and potash. Perennial lespedeza (*sericea*) is grown to a limited extent on clay soils in western Florida.

Feeding Grass to Get It Started

The realization that good grazing means cheap feed and plenty of it has caused Florida farmers and cattlemen to use more fertilizer on pastures than ever before. The Florida Station's research has shown that plant foods applied in establishing and maintaining

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B. K. Hendrix, Manager of the Flying M Ranch, Stuart, Florida, stands in waist-high, first-growth Pangola grass, three months from planting.

Above: This fertilizer distributor and seeder will spread at the rate of 15 tons per day.

Below: Coastal Bermuda grass sprigged in 42-inch rows July 1944. Photo made July 1945.

Above: **Cattle are on typical unimproved pasture at Clarksville, Florida. Photographed in 1946.**

Below: **A purebred Brahma herd on a large improved pasture, Osceola County, Florida, 1947.**

Above: **When Pensacola Bahia was first becoming established, children were hired to strip seeds by hand from grass growing on vacant lots in Pensacola.**

Below: **Harvesting grass from Experiment Station nursery plots, June 1947.**

The Editors Talk

A Concise Tribute to Agricultural Science

In a short talk over the Columbia broadcasting system on December 7, Secretary of Agriculture Clinton P. Anderson paid a concise, well-worded, and thought-provoking tribute to American agricultural science and all of its thousands of workers. It is worth repeating here for our readers, for it helps in these uncertain times for everyone to take stock of himself especially in relation to his being an asset to the welfare of our country.

"If American croplands were fenced into equal shares," Secretary Anderson said, "your plot would be smaller than three football fields. That's only about three acres, compared with about four at the end of the first world war. And if our population grows as we expect, your share by 1970 will be reduced to about two and three-quarters acres.

"Think of your future in terms of your diminishing share of land. You will have to depend on it because there is very little more that we can bring into use through drainage and irrigation. And we are still using up our soil resources faster than we rebuild them. Yet, your little patch of cropland, together with the permanent pasture and range, is giving you a higher standard of living and providing a great deal of food to relieve hunger abroad.

"In the future, on the same land we have today, fewer farmers will furnish greater abundance for more people. The matchless science of agriculture already enables the average farm worker to turn out nearly two-thirds more than he did 20 years ago.

"We shall have increasingly better crop varieties, including more hybrids. Our plant explorers, after a wartime lapse, are searching the world for new plants. With the old and the new parent stock, scientists will create improved varieties to resist new strains of disease and insects that continually threaten our crops. They will give us progressively higher yields. They will make possible finer quality and greater food value.

"Besides creating new varieties, our plant breeders now are using a discovery so new that they have only begun to see its possibilities. By applying to certain plants a drug commonly used to treat gout in humans they can produce larger and finer specimens and hybrids that would otherwise be impossible. With other chemicals, they can regulate the growth of plants. They can feed a plant radioactive atoms of food, trace their progress through the plant tissue, and thus gain new knowledge about plants and their soil and fertilizer needs.

"In livestock production we are just beginning to use the principle of hybrid vigor, so successful in plant breeding. Farmers are beginning commercial production of hybrid hogs that bear larger litters, make quicker gains, and produce a larger percentage of bacon and chops. Hybrid chickens and cattle may come next.

"New machinery that saves labor or does better work will increase our farming efficiency. We are beginning to make great progress with powerful new chemical

insect killers. Farmland will itself be changed by soil conservation measures to preserve fertility and give greater protection against the erosion that has damaged so much of our land in the past.

"We are learning more about how to eat for good health. Science is tackling the problems of distribution—to help move the abundance of our farms to consumers with less waste and at lower cost.

"The benefits of the changes you will see on the farms of tomorrow will radiate out to our industries and homes so that your diminishing patch of land—smaller than three football fields—can actually raise your standard of living in tomorrow's world.

"But to assure this we must build lasting peace; we must maintain full employment; we must conserve our soil; we must keep our agriculture strong."

Winter Covers

To those of us brought up in northern climes where winter means cold and snow, a deep snow that lay on the ground for weeks was considered a good "winter cover." It protected seedings, held the topsoil, and its gradual thawing in the spring restored the moisture content of the soil. However, since erosion has been named the No. 1 culprit in our soil conservation programs and the losses due to spring "run-offs" realistically measured, the term "winter cover" has assumed quite a different meaning.

North and south, winter covers now mean crops which are especially planted for the purpose of checking erosion, adding organic matter to the soil, and improving its fertility. The advantages of such covers are readily seen and experienced in the reduction of the run-off caused by melting snows and rains, the improvement of soil tilth, and the lessened leaching of plant food. In addition, in many areas they have lengthened the grazing season for livestock, and in the South have made possible the year-round grazing programs.

Legumes, wherever adaptable, are preferred for their nitrogen-gathering ability. Those commonly grown in the South where climate and the use of fertilizers encourage good stands include hairy vetch, smooth vetch, Austrian winter pea, crimson clover, bur-clover, and sour clover. In the North, where the growing season after harvest of the cash crop is short, rye or rye grass is commonly used. A winter cover also can be provided by planning the rotation so as to include sods of various types which are very efficient, especially on soils most subject to erosion. Leaving a trash cover of crop residues is to be considered.

The increasing interest in winter protection for our soils reflects the growing importance being accorded the maintenance of their fertility. This interest should be furthered wherever possible, for in it is a powerful weapon for thwarting erosion, the silent and more or less evident thief of soil fertility. It is to be hoped that "winter covers," already a term which has outgrown the household, will become familiar to all good farm management.

To Our Readers:

Heartiest Greetings of the Season

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1922	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945	22.4	42.6	139.0	200.0	114.0	149.0	15.10	51.80	....
1946									
November	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
December	29.98	43.5	126.0	210.0	122.0	192.0	17.70	91.50	..
1947									
January	29.74	39.0	129.0	220.0	121.0	191.0	17.50	90.40	....
February	30.56	31.9	131.0	228.0	123.0	199.0	17.50	88.20	....
March	31.89	33.6	139.0	235.0	150.0	244.0	17.40	88.00	....
April	32.26	30.1	147.0	233.0	163.0	240.0	17.20	88.00	....
May	33.50	44.6	153.0	233.0	159.0	239.0	16.80	83.70	....
June	34.07	46.0	156.0	249.0	185.0	218.0	16.00	79.60	....
July	35.88	48.5	169.0	251.0	201.0	214.0	15.10	79.00	....
August	33.15	38.1	161.0	270.0	219.0	210.0	15.30	75.50	..
September	31.21	40.7	149.0	240.0	240.0	243.0	16.10	75.60	..
October	30.65	41.6	150.0	205.0	223.0	266.0	16.80	90.60	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1922	185	228	95	114	116	109	98	135	....
1923	231	190	133	137	129	105	110	183	....
1924	185	190	98	170	166	141	107	147	143
1925	158	168	245	188	109	163	108	140	143
1926	101	179	189	134	116	138	112	98	139
1927	163	207	146	124	132	135	87	154	127
1928	145	200	76	134	131	113	95	152	154
1929	135	183	189	133	124	117	92	137	137
1930	77	128	131	123	93	76	93	98	129
1931	46	82	66	83	50	44	73	40	115
1932	52	105	55	62	50	43	52	46	102
1933	82	130	118	79	81	84	68	57	91
1934	100	213	64	91	127	96	111	146	95
1935	90	184	85	80	102	94	63	135	119
1936	100	236	164	106	163	116	94	148	104
1937	68	204	76	93	81	109	74	87	110
1938	69	196	80	83	76	64	57	97	88
1939	73	154	100	85	88	78	67	94	91
1940	80	160	78	97	96	77	64	96	111
1941	137	264	116	107	117	107	81	211	129
1942	153	369	168	136	143	124	91	202	163
1943	160	405	188	232	174	154	125	231	245
1944	167	420	214	219	170	160	138	234	212
1945	181	435	199	228	178	169	127	230	224
1946									
November	236	438	176	228	198	214	145	399	207
December	242	435	181	239	190	217	149	406	166
1947									
January	240	390	185	351	188	216	147	401	238
February	246	319	188	260	192	225	147	391	275
March	257	336	199	268	234	276	147	390	299
April	260	301	211	265	254	271	145	390	295
May	270	446	220	265	248	270	142	371	286
June	275	460	224	284	288	247	135	353	215
July	289	485	242	286	313	242	127	350	189
August	267	381	231	308	341	238	129	335	211
September	252	407	214	273	374	275	136	335	179
October	247	416	214	233	347	301	142	402	238

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946						
November	2.22	1.46	15.19	11.26	12.14	12.75
December	2.22	1.46	14.63	11.37	12.14	11.17
1947						
January	2.36	1.46	12.98	11.06	12.14	10.32
February	2.41	1.46	10.01	11.06	12.14	10.17
March	2.41	1.46	11.98	11.06	12.50	10.50
April	2.41	1.51	11.72	10.79	12.75	11.39
May	2.41	1.51	10.55	9.98	12.75	8.80
June	2.41	1.51	10.94	9.98	12.75	8.26
July	2.41	1.59	12.56	9.98	12.75	8.66
August	2.53	1.60	13.01	9.98	12.75	8.73
September	2.66	1.73	13.65	10.41	12.75	10.72
October	2.66	1.78	15.00	10.85	12.75	13.66

Index Numbers (1910-14 = 100)

1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946						
November	83	51	434	319	360	362
December	83	51	418	322	360	317
1947						
January	88	51	371	313	360	293
February	90	51	286	313	360	289
March	90	51	342	313	371	298
April	90	53	335	306	378	324
May	90	53	301	283	378	250
June	90	53	313	283	378	234
July	90	56	359	283	378	246
August	94	56	372	283	378	248
September	99	61	390	295	378	305
October	99	62	429	307	378	388

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[1]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[1]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367[1]
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946							
November	.700	2.60	6.60	.535	.797	26.00	.200
December	.700	2.60	6.60	.535	.797	26.00	.200
1947							
January	.700	2.60	6.60	.535	.797	26.00	.200
February	.720	2.60	6.60	.535	.799	26.00	.200
March	.740	2.75	6.60	.535	.797	26.00	.200
April	.740	2.97	6.60	.535	.797	26.00	.200
May	.740	2.97	6.60	.535	.797	26.00	.200
June	.752	2.97	6.60	.330[1]	.589[1]	12.76[1]	.176
July	.760	2.97	6.60	.353	.629	13.63	.188
August	.760	3.08	6.60	.353	.629	13.63	.188
September	.760	3.42	6.60	.353	.629	13.63	.188
October	.760	3.42	6.60	.375	.669	14.50	.200
Index Numbers (1910-14 = 100)							
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1920	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946							
November	131	72	135	75	84	108	83
December	131	72	135	75	84	108	83
1947							
January	131	72	135	75	84	108	83
February	134	72	135	75	84	108	83
March	138	76	135	75	84	108	83
April	138	82	135	75	84	108	83
May	138	82	135	75	84	108	83
June	140	82	135	60	62	53	80
July	142	82	135	64	66	56	82
August	142	85	135	64	66	56	82
September	142	95	135	64	66	56	82
October	142	95	135	68	70	60	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1923.....	143	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	156	151	112	100	131	109	80
1926.....	146	155	146	119	94	135	112	86
1927.....	142	153	139	116	89	150	100	94
1928.....	151	155	141	121	87	177	108	97
1929.....	149	154	139	114	79	146	114	97
1930.....	128	146	126	105	72	131	101	99
1931.....	90	126	107	83	62	83	90	99
1932.....	68	108	95	71	46	48	85	99
1933.....	72	108	96	70	45	71	81	95
1934.....	90	122	109	72	47	90	91	72
1935.....	109	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	122	131	126	81	50	129	95	75
1938.....	97	123	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	124	131	127	86	56	130	102	77
1942.....	159	152	144	93	57	161	112	77
1943.....	192	167	151	94	57	160	117	77
1944.....	195	176	152	96	57	174	120	76
1945.....	202	180	154	97	57	175	121	76
1946								
November.	263	224	198	127	67	382	131	78
December..	264	225	204	127	67	376	131	78
1947								
January...	260	227	206	126	69	359	131	78
February..	262	234	209	124	70	329	134	78
March.....	280	240	216	128	70	354	138	78
April.....	276	243	215	129	71	354	138	78
May.....	272	242	215	127	71	339	138	78
June.....	271	244	215	125	71	343	140	63
July.....	276	244	219	128	72	359	142	67
August....	276	249	223	130	75	364	142	67
September.	286	253	230	133	79	372	142	67
October...	289	254	230	136	80	387	142	71

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.**

** **The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizing Avocados on Rockdale Limestone Soils," Sub-Tropical Experiment Station, Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Press Bul. 635, Sept. 1947, Geo. D. Ruehle.

"Inspection of Commercial Fertilizers," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Cir. 327, June 1947.

"Soil Survey of Bartholomew County, Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Series 1936, No. 27, July 1947, H. P. Ulrich, T. E. Barnes, Sutton Myers, O. C. Rogers, and A. T. Wiancko.

"Commercial Fertilizers in Kentucky, 1946," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Regulatory Bul. 55, April 1947.

"The Potash Problem in Kentucky Agriculture," Agr. Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 432, May 1947, George Roberts.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Univ. of Mass., Amherst, Mass., Control Series, Bul. No. 133, July 1947.

"Report of Fertilizer Sales in Michigan from January 1 to June 30, 1947," Agr. Ext. Serv., Mich. State College, East Lansing, Mich., Oct. 21, 1947, C. E. Millar.

"Analyses of Commercial Fertilizers, Manures, and Agricultural Lime, 1946," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J., Insp. Series 26, April 1947, Stacy B. Randle.

"Diagnosis and Improvement of Saline and Alkali Soils," Bu. of Plant Industry, U.S.D.A., Washington, D. C., July 1947.

Soils

"Liming Soils," Agr. Ext. Serv., Univ. of Mass., Amherst, Mass., Leaflet No. 134, Rev. April 1947, Ralph W. Donaldson.

"Fertility Maintenance and Management of South Dakota Soils," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Cir. 68, May 1947, Leo F. Puhr and W. W. Worzella.

"Soil Survey of Swain County, North Carolina," Agr. Research Admin., U. S. D. A., Washington, D. C., Series 1937, No. 18, July 1947, S. O. Perkins and William Gettys.

"Soil Survey of Niagara County, New York," Agr. Research Admin., U. S. D. A., Washington, D. C., Series 1937, No. 20, Sept. 1, 1947, C. S. Pearson, Wilber Secor, D. F. Kinsman, J. C. Bryant, J. E. Dalrymple, C. B. Lawrence, Herbert Hopper, and A. T. Sweet.

"The Agricultural Conservation Program on California's Farms and Ranches," Prod. and Marketing Admin., U. S. D. A., Washington, D. C., PA-31, July 1947.

Crops

"The Effect of Common Salt on Rice Production," Agr Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 465, Feb. 1947, L. C. Kapp.

"Apple, Quince, & Pear Rootstocks in California," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Bul. 700, May 1947, Leonard H. Day.

"The Effects of Immaturity and Artificial Drying upon the Quality of Seed Corn," Div. of Forage Plants, Central Exp. Farm, Ottawa, Can., Publ. No. 790, June 1947, F. Dimmock.

"Guide to Crop Production in Ontario," Standing Committee on Field Crop Improvement, Ontario Dept. of Agr., Toronto, Ontario, Can., Ext. Cir. No. 68, Rev. May 1947.

"Horticultural Experiment Station, Report for 1945 and 1946," Ontario Dept. of Agr., Vineland, Ont., Can.

"Barley in Colorado," Agr. Ext. Serv., Colo. A & M, Fort Collins, Colo., Cir. 150-A (Rev. of D-27), July 1947, R. H. Tucker and D. W. Robertson.

"Alfalfa Varieties and Seed Mixtures," Agr. Exp. Sta., Univ. of Conn., Storrs, Conn., Bul. 258, March 1947, B. A. Brown and R. I. Munsell.

"Management of Cigar-Wrapper Tobacco Plant Beds in Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Press Bul. 637, Sept. 1947, Randall R. Kincaid.

"Growing Pecans in Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Bul. 501, Reprinted April 1947, Theodore L. Bissell and George H. Firor.

"Small Grains in Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Ext. Cir. 314, Rev. Sept. 1946, E. D. Alexander.

"Fifty-Ninth Report of the Director, for the

Period ending June 30, 1946," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind.

"Report of the Director, July 1, 1944 to June 30, 1945," Agr. Ext. Serv., Purdue Univ., Lafayette, Ind.

"Soil Type and Soil Management Factors in Hemp Production," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Research Bul. 352, July 1947, A. J. Vessel and C. A. Black.

"Growing the Gladiolus," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Bul. P 85, July 1947, L. C. Grove.

"Forty-first Biennial Report for the Two Years Ending June 30, 1946," Kans. State College of Agr. and Applied Science, Manhattan, Kans.

"Osage and Neosho Oats," Agr. Exp. Sta., Kans. State College, Manhattan, Kans., Cir. 242, Feb. 1947, E. G. Heyne, C. O. Johnston, E. D. Hansing, and A. L Clapp.

"Fifty-ninth Annual Report of the Director, for the Year 1946," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky.

"The Relation of Curing Conditions to Quality in Burley Tobacco," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 496, Dec. 1946, R. N. Jeffrey.

"Commercial Strawberry Project for 4-H Club Members," Agr. Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 430, March 1947, W. W. Magill.

"High Yields of Corn per Acre, Results of a Statewide Corn-Growing Demonstration in Kentucky, 1946," Agr. Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 433, April 1947, W. C. Johnstone.

"Research in Agriculture, Annual Report 1944-1945," Agr. Exp. Sta., La. State Univ., Baton Rouge, La.

"Watermelon Production in Louisiana," Agr. Ext. Serv., La. State Univ., Baton Rouge, La., Ext. Cir. 202, May 1946 (Rev. June 1947), Ralph S. Woodward, John A. Cox, and Joseph Montelaro.

"Fifty-ninth Annual Report for the Fiscal Year ending June 30, 1946," Agr. Exp. Sta., Univ. of Md., College Park, Md., Volume 59, W. B. Kemp.

"Strawberry Growing in Massachusetts," Agr. Ext. Serv., Mass. State College, Amherst, Mass., Leaflet No. 29 (Rev. April 1947), A. P. French.

"Grape Culture in Massachusetts," Agr. Ext. Serv., Univ. of Mass., Amherst, Mass., Ext. Leaflet No. 64 (Rev. April 1947), O. C. Roberts.

"Blueberries in the Garden," Agr. Ext. Serv., Mass. State College, Amherst, Mass., Leaflet No. 240, April 1947, John S. Bailey.

"Twelfth Biennial Report for the Fiscal Years ending June 30, 1945 and June 30, 1946," State Dept. of Agr., Lansing, Mich.

"Tests of Cotton Varieties for the Hill Soils of Mississippi 1946," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 442, Feb. 1947, J. F. O'Kelly.

"Commercial Potato Production in Nebraska," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 384, June 1947, H. E. Werner.

"Science and the Land, 67th Annual Report, 1945-46," Agr. Exp. Sta., Rutgers Univ., New Brunswick, N. J.

"Thirty-first Annual Report of the New Jersey State Department of Agriculture, July 1, 1945-June 30, 1946," Trenton, N. J.

"Raspberry Growing, Culture, Diseases and Insects," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Ext. Bul. 719, May 1947, G. L. Slate, A. J. Braun, and F. G. Mundinger.

"The Grasses: Their Growth and Development," State Agr. Exp. Sta., Wooster, Ohio, Agron. Mimeo. No. 105, 1946, Morgan W. Evans.

"Results of Crop Rotation Studies, Soil Fertility Experiments, and Corn, Sorghum, and Small-grain Variety Tests at the Agronomy Farm, Perkins," Agr. Exp. Sta., Okla. A. & M., Stillwater, Okla., Mimeo. Cir. M-167, May 1947, Horace J. Harper.

"Wheat Production in Oklahoma," Agr. Ext. Serv., Okla. A & M, Stillwater, Okla., Cir. 447.

"Year Book 1946," State Dept. of Agr., Columbia, S. C.

"Agronomy Handbook for South Carolina," Ext. Agron. Div., Clemson Agr. College, Clemson, S. C., Bul. 104, June 1947.

"Handbook of Standard Forestry Practices for South Carolina," Forestry Committee of S. C., Clemson Agr. College, Clemson, S. C., Bul. 107, Reprinted March 1947.

"1945-1946 Annual Report of the Department of Agriculture to the Governor of the State of South Dakota, for the Fiscal Year Ending June 30, 1946," Pierre, S. D.

"Forage from Kochia," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Bul. 384, Feb. 1947, E. L. Erickson.

"Feebar Barley," Agr. Exp. Sta., State College, Brookings, S. D., Cir. 67, April 1947, J. E. Grafius.

"Small Grain Variety Tests in South Dakota, 1946," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Pamph. No. 11, Feb. 1947, J. E. Grafius.

"Barley Variety Studies in Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Bul. No. 203, April 1947, N. I. Hancock and O. H. Long.

"Jellicorse Corn," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. No. 96, March 1947, Ben P. Hazlewood.

"Peach Varieties for Central East Texas," Agr. Exp. Sta., Texas A. & M., College Station, Texas, Bul. No. 687, March 1947, H. F. Morris.

"Sweet Corn Tests in the Lower Rio Grande Valley," Agr. Exp. Sta., Texas A & M, College Station, Texas, Bul. No. 689, June 1947, B. S. Pickett.

"Fruit Varieties for Texas," Agr. Ext. Serv., Texas A & M, College Station, Texas, C-150, 1946, J. F. Rosborough and C .R. Heaton.

"Cotton Varieties in the Lower Rio Grande Valley, 1946," Agr. Exp. Sta., Texas A. & M., College Station, Texas, P. R. 1079, May 22, 1947, W. H. Friend.

"Good Dairy Cows Will Turn Feed Into Profit," Agr. Ext. Serv., Va. Polytechnic Institute, Blacksburg, Va., Cir. 411, April 1947.

"Crop Rotations under Irrigation at the Irrigation Branch Experiment Station, Near Prosser, Washington," Agr. Exp. Sta., Pullman, Wash., Bul. No. 481, Nov. 1946, C. Emil Nelson and Carl A. Larson.

"Grain Feeding Cattle on Pasture," Agr. Exp. Sta., Pullman, Wash., Bul. No. 483, Jan. 1947, M. E. Ensminger, A. G. Law, T. J. Cunha, and J. L. Schwendiman.

"Marfed Wheat," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. No. 485, March 1947, O. A. Vogel, S. P. Swenson, Harley D. Jacquot, and C. S. Holton.

"Legumes for Greater Production in Washington," Ext. Serv., State College of Wash., Pullman, Wash., Ext. Cir. 109, July 1947.

"Lawns," Ext. Serv., State College of Wash., Pullman, Wash., Ext. Bul. 364, May 1947, E. J. Kreizinger.

"Wisconsin Dept. of Agriculture Bulletin," Madison, Wis., No. 275, Sept. 1946.

"Vetch on Sandy Soils," Agr. Ext. Serv., Univ. of Wis., Madison, Wis., Stencil Cir. 254, May 1947, A. R. Albert and H. L. Ahlgren.

"Fifty-Sixth Annual Report, 1945-46," Agr. Exp. Sta., Univ. of Wyo., Laramie, Wyo.

"Improvement and Industrial Utilization of Soybeans," Agr. Research Admin., U. S. D. A., Washington, D. C., Misc. Publ. No. 623, Sept. 1947.

"Seed for Regrassing Great Plains Areas," U.S.D.A., Washington, D. C., Farmers' Bul. No. 1985, July 1947, Max M. Hoover, James E. Smith, Jr., A. E. Ferber, and D. R. Cornelius.

"Russian Dandelion (Kok-Saghyz), An Emergency Source of Natural Rubber," U. S. D. A., Washington, D. C., Misc. Publ. 618, June 1947, W. Gordon Whaley and John S. Bowen.

Economics

"Canning Tomatoes Situation in California, 1947," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 369, June 1947, Walter D. Fisher.

"California Olives Situation and Outlook, 1947," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 370, July 1947, Arthur Shultis.

"Avocado Production Cost Analysis, Orange County, 1946," Agr. Ext. Serv., Univ. of Calif., Santa Ana, Calif., Seventeenth Annual Summary.

"Statistical Information Pertaining to the Marketing of Agricultural Products in Connecticut, 1946," State Dept. of Farms and Markets, State Office Bldg., Hartford, Conn., Sept. 1947.

"Delaware 1947 Outlook for Agriculture and Farm Family Living," Agr. Ext. Serv., Univ. of Delaware, Newark, Del., Ext. Folder No. 12, Jan. 1947, Louise R. Whitcomb and R. O. Bausman.

"Georgia's 1947 Agricultural Outlook," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., Bul. 538, Dec. 1946.

"Your Farm and Business Report—1946: Farming-type Area Three, Western Livestock and Grain Area, AE-2449; Farming-type Area Four, East Central Cash Grain Area, AE-2450; Farming-type Area Five, West Central General Farming Area, AE-2451; Farming-type Area Six, St. Louis Dairy and Wheat Area, AE-2452; Farming-type Area Seven, South Central Mixed Farming Area, AE-2453; Farming-type Area Eight, Wabash Valley Grain and Livestock Area, AE-2454; Farming-type Area Nine, Southern Fruit and Vegetable Area, AE-2455," Dept. of Agr. Econ., Univ. of Ill., Urbana, Ill.

"Seasonal Patterns of Tobacco Sales and Prices from River-Warehouse Days to the Present Looseleaf Auctions," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 497, Jan. 1947, Carl M. Clark.

"People and Resources in Eastern Kentucky, A Study of a Representative Area in Breathitt, Knott, and Perry Counties," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 500, May 1947, Howard W. Beers and Catherine P. Heflin.

"Cost and Utilization of Power and Equipment on Farms in the Mississippi River Delta Cotton Area of Louisiana," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. No. 417, May 1947, Frank D. Barlow, Jr. and Leo J. Fenske.

"Costs and Returns on Family-type Sugar Cane Farms in Louisiana, 1938 to 1945," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. No. 420, June 1947, J. Norman Efferson.

"An Analysis of Changes in Sweet Potato Prices," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. No. 421, June 1947, M. E. Miller and M. D. Woodin.

"Comparative Census of Maryland Agriculture by Counties," Agr. Exp. Sta., Univ. of Md., College Park, Md., Misc. Publ. No. 52, Dec. 1946, A. B. Hamilton.

"Combination Ranching in Southeastern New Mexico," Agr. Exp. Sta., N. M. A. & M., State College, N. M., Bul. 332, June 1946, H. B. Pingrey.

"Ranching in Northwestern South Dakota," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Bul. 385, April 1947, C. R. Hoglund and M. B. Johnson.

"Graphic Summary of Changes in Use of Crop Land in Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Rural Research Series, Monograph No. 218, April 25, 1947, B. H. Luebke.

"Farmers' Cooperative Handbook," Agr. Ext. Serv., Texas A. & M., College Station, Texas, B-152, 1947, M. C. Jaynes.

"Price and Production Trends in Virginia Truck Crops," State Agr. Exp. Sta., Blacksburg, Va., Tech. Bul. 105, Feb. 1947, Maynard C. Conner.

"Farmer, Forester—What's the Difference?" Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Cir. 116, Oct. 1947, Knut Lunnum.

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"The Farmer's Share of the Consumer's Food Dollar," U.S.D.A., Wash., D. C., Leaflet No. 123, Oct. 1946.

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"Bibliography of Marketing Publications Issued by the U.S.D.A. from 1937 through 1946," U.S.D.A., Washington, D. C., Appendix, Exhibit 3.

Alfalfa May Rob Soil, Tests Reveal

THE removal of three cuttings of alfalfa draws heavily on the soil for phosphorus, potassium, and lime. When alfalfa is grown for several years on the same land, these elements must be replenished in the soil or the crop will suffer, declares H. J. Snider, Agronomy Department, University of Illinois College of Agriculture. Under suitable conditions alfalfa may supply a large part of the soil's nitrogen supply.

In some tests on the farm of Jeff Beazly near Mansfield, Piatt County, three cuttings of alfalfa in 1946 removed plant-food elements worth approximately $24 an acre. This alfalfa yielded about four and one-half tons of hay an acre, which contained a total of 260 pounds of nitrogen, 18 pounds of phosphorus, 220 pounds of potassium, and about 400 pounds of lime.

To replace these amounts in fertilizers and limestone would require an outlay of about $24. The nitrogen is largely charged off on the basis that legumes may take only about one-third of this element from the soil.

Florida Grows Good Pasture . . .

(*From page* 26)

pastures bring returns comparable to applications to field crops and groves. As a result, cowboys are now riding jeeps pulling fertilizer distributors over thousands of acres—all the while muttering because they are not astride their ponies. But the fertilizer materials they distribute are bringing better cattle for the roundups.

Lime and the major nutrients, nitrogen, phosphorus, and potash, are being supplemented by the minors as cattlemen are learning to feed their animals through grass more and through the mineral box less. Records kept by Dr. W. G. Kirk at the Range Cattle Station during the winter of 1945-46 revealed that cattle on unburned native range consumed 76 pounds of supplemental minerals, while those on partially fertilized pasture ate only 11 pounds.

The age-old plague known as salt-sick formerly caused cattlemen heavy losses on certain ranges every year. Their animals became unthrifty, even in the midst of bountiful grazing, and lost weight; some died, and others had to be moved to healthy ranges to regain their thrift. In 1931 Florida Station workers discovered that salt-sick

was a nutritional deficiency due to lack of iron and copper in the herbage grazed. Later it was learned that cobalt is deficient on some ranges also. The grasses may not show the deficiency, but animals grazing them do.

Deficiencies of iron, copper, and cobalt usually are found together and are more prevalent on soils of the Lakeland, Leon, Immokalee, Blanton, and Portsmouth series—which include most of the palmetto flatwoods areas, as well as yellow soils in the sandy ridge land growing blackjack oaks. Where minor elements are necessary, the Florida agronomists recommend alone or in a mixture at the following rates: Copper sulphate, 10 to 20 pounds per acre; zinc sulphate, 5 to 10 pounds; manganese sulphate, 10 to 20 pounds; and borax, 5 to 10 pounds per acre. Minor elements have proven most beneficial on soils of southern and central Florida.

Another deficiency—lack of phosphorus, which causes sweeney—often occurs independently. It can be corrected by fertilizing the pasture with phosphate or allowing the cattle access to feeding bone meal or defluorinated superphosphate.

Starting the Pasture

Cattlemen are well aware of the fact that briers, saw-palmettos, bushes, and trees furnish little or no feed for animals and prevent the growth of grasses which would feed the animals. Consequently, they are clearing their lands with bulldozers and heavy cutters and disking them thoroughly before they attempt to start grasses or clovers. Pasture plants, like other crops, require a good seedbed for best results.

Where a natural supply of fresh, clean water is not already available, windmills or pumps not over two miles apart, so the cattle never have to walk more than a mile to water, are installed to serve from two to four pastures each.

Fertilization according to the needs of the soil and the plants to be grown gives the newly planted pasture grasses or legumes a rapid start and increases the nutritive value of the herbage. On most soils clovers require the application of from one to two tons of limestone, 600 pounds superphosphate, and 100 pounds muriate of potash per acre. Lespedeza requires almost as much.

W. E. Stokes, Head of the Florida Station's agronomy department, says carpet and Bahia grasses make better growth when given an application of 400 pounds per acre of 4-8-8 fertilizer before seeding on less acid soils. On more acid soils a ton of limestone per acre in addition is desirable, especially for Bahia.

Bermuda, Dallis, and Pangola require more fertile soils than carpet and Bahia. Liming at the rate of one ton per acre and fertilizing with 400 to 600 pounds per acre of 4-8-8 or similar mixtures are desirable.

The late Dr. W. A. Leukel, Station Agronomist, evolved an economical method of establishing carpet grass on flatwoods range free of palmettos and other objectionable growth. At the beginning of the rainy summer season, usually in late June, he burned native wiregrass and seeded the carpet. He found it best to select an area which had not been burned for two years, place adequate fire lines to prevent the fire from spreading to areas where it was not wanted, and widen these barriers by backfiring against the wind before firing into the wind. After two or three days, when the ash has settled and preferably just before a rain, seed with 10 to 15 pounds of carpet grass per acre. Keep the burned and seeded area accessible to grazing cattle at all times—they trample in the seed and help to get a sod. Adjacent areas can be burned in following seasons.

This method gives a good stand of carpet and, if done in the early part of the rainy season, almost completely eliminates wiregrass.

Fertilizing Established Pastures

Fertilizer and lime requirements for maintaining pasture grasses depend upon the species being grown, as well

as the soil and previous fertilizer applications. The Bermudas, Dallis, and Pangola require much higher levels of fertility than the Bahias and carpet. Under low fertility levels carpet grass tends to crowd out such species as Bermuda and Dallis.

Nitrogen is the most important single element necessary in the maintenance of established pastures, as shown by results of four years of tests on Leon, Plummer, Bladen, and Fellowship fine sands. Complete fertilizers containing phosphorus and potash, however, gave still better results. The addition of lime gave only slight additional increases in yields.

Reporting on results of these experiments, Mr. Stokes cites the following percentage increases in yields over no fertilizer, as averaged for the four soil series: 36 pounds nitrogen, 35 per cent increase; 72 pounds nitrogen, 64 per cent; 144 pounds phosphoric acid and 50 pounds potash, 11 per cent; 36-144-50 pounds NPK, 49 per cent; 72-144-50 pounds NPK, 84 per cent; 72-144-50 pounds NPK plus 2,000 pounds dolomitic limestone, 91 per cent; and 72-144-50 pounds NPK plus 2,000 pounds calcic limestone, 85 per cent increase in yield.

The Florida results indicate that phosphorus, lime, and potash can be applied every three or four years, if nitrogen is applied annually, with about as good effect on grass yields as annual applications of the minerals. The infrequent applications should be heavy.

Where the agronomists applied annually 72-36-25-500 pounds of NPK and lime, mean yields of dry carpet grass herbage for four years were 3,085 pounds. Where they applied 72 pounds of nitrogen annually and 72-50-1,000 pounds of PK and lime every other year, mean yields for four years were 2,870 pounds. Where they applied 72 pounds of nitrogen annually and 144-100-2,000 pounds of PK and lime the first year only, average yields for the four years were 2,930 pounds of dried herbage.

Fertilizers, of course, affect the mineral content as well as yield of grass. Carpet grass receiving nitrogen fertilizer only contained lower percentages of calcium, phosphorus, and potash than unfertilized grass. On the other hand, carpet grass receiving lime, nitrogen, phosphorus, and potash was 61 per cent higher in calcium, 75 per cent higher in phosphorus, and 24 per cent higher in potassium than unfertilized grass. Thus the grasses receiving complete fertilizer carried much higher nutritive qualities.

Mr. Stokes and his fellow agronomists recommend either of the following four programs for maintaining carpet or Bahia grass pastures on mineral soils:

1. Apply 300 to 500 pounds of 6-6-6, 5-7-5, 4-8-8, or similar fertilizer every other year. On years when complete fertilizer is not applied, fertilize with 100 to 200 pounds per acre of sulphate of ammonia, nitrate of soda, or their equivalent. May apply lime at the rate of one ton per acre every five to seven years.

2. Superphosphate at the rate of 200 to 400 pounds per acre every three to five years generally will improve the phosphorus and calcium contents of the forage and stimulate growth.

3. From 1,000 to 1,800 pounds of rock or colloidal phosphate increase the phosphorus and calcium contents of grass and generally stimulate growth. The addition of nitrogen and potash would improve growth. (This treatment is not recommended for the red soils of western Florida.)

4. Basic slag at the rate of 500 to 1,000 pounds per acre every three to five years may be used.

For maintaining Bermuda, Pangola, Dallis, and Napier grasses where legumes are not present, they recommend either of the following programs:

1. Apply 400 to 500 pounds of a 6-6-6 or similar fertilizer annually. Additional nitrogen would be desirable. Complete fertilizers can be applied

every other year, with nitrogen applied in the alternate years.

2. If rock, colloidal, superphosphate, or other phosphate is used, it should be supplemented with nitrogen and potash. Lime may be needed every three to six years.

For sandy soils underlaid with lime, they suggest applying a complete fertilizer and nitrogen as recommended for acid sandy soils, but lime will not be needed.

For muck soils apply 200 to 400 pounds of 0-8-12 or 0-8-24 per acre every one or two years. The agronomists do not recommend rock or colloidal phosphate for non-acid sands and mucks.

As yet they do not know how frequently it will be necessary to apply the minor elements. If established sods have not been fertilized with copper and manganese they should receive the same applications recommended for establishing pastures—10 to 20 pounds each of copper and manganese sulphate per acre.

Management for Maintenance

Weed control and sufficient grazing, without overgrazing, are essential for pastures to return their highest yields. Weeds are controlled by mowing machines or rotary choppers, the latter being more satisfactory for rough land and pastures containing woody plants. Annual weeds can be exterminated generally by mowing during the bloom stage to prevent seeding. Roy Blaser, former Agronomist at the Florida Station, found that dogfennel cut one inch from the ground on July 7 was practically eliminated for that year, while field thistles cut two inches above ground on May 31 also were practically eliminated. When these weeds were cut six to eight inches above ground with a rotary chopper, many revived sufficiently to produce seed.

Pasture plants in the vegetative stage are growing rapidly, producing new leafage, taking in a maximum of minerals, high in protein and minerals and low in fibers and woody materials. As they mature or approach the reproductive stage, when they begin to form seed heads, they are more fibrous and lower in mineral content.

Where there are not enough animals on the pasture to keep the grasses in a vegetative stage, mowing will aid materially in doing this. Mowing is especially beneficial during the summer months when the grasses have a tendency to seed heavily. It is desirable, however, to permit some pastures to grow to, or nearly to, maturity in September or October to furnish winter feed. Many good cattlemen take their animals off of certain pastures by early September to have a reserve of winter grazing of mature and frosted grasses.

Overgrazing will kill out practically any of the improved pasture grasses and is to be avoided.

Harvesting Seed

Until recent years Florida has looked to other areas for practically all of its grass and legume seed. Now, however, it has a well-established seed industry that has come as a companion to the improved pasture program. Florida seed often are superior to those of the same kinds of grasses and legumes obtained from other areas. They are adapted to the State's climatic conditions.

Carpet and Bahia grass seed have been gathered with combines or with seedpan attachment to mowing machines, and a special seed stripper has been devised for use in harvesting Pensacola Bahia seed which do not mature all at the same time. Dallis grass also seeds prolifically in Florida, as do the clovers grown there and annual lespedeza. It is hoped that the fescues will become the source of another seed industry.

Reaping the Harvest of Beef

That the carrying capacity and quality of feed produced on improved permanent pastures is much superior to

that of native wiregrass range is now well recognized. Where 20 and sometimes even 40 acres of native range are required for one animal, the improved pastures often carry a cow to the acre for a good part of the year, especially if the improved pastures contain lespedezas and clovers in addition to grasses. Pasture legumes are of better feeding value than grasses, increase the grass growth, and improve its quality.

Animal husbandmen have been cooperating with agronomists in Florida for several years in testing the carrying capacity and beef-producing ability of improved permanent pastures, and they have learned pretty well what the average results will be. On the basis of their data, various pasture plants when grazed with steers may be expected to yield the following gains in pounds of beef per acre during a grazing season: Wiregrass, 5 to 10 pounds; carpet, Bahia, Napier, or Bermuda grass, 50 to 300 pounds; carpet and lespedeza or other grass-lespedeza mixture, 100 to 250 pounds; and carpet and clover or other grass-clover mixtures, 200 to 675 pounds per acre.

Animal Husbandman R. S. Glasscock says you can sit in the shade—after your pasture is doing good—and harvest $100 worth of beef per acre during a season. Perhaps it isn't quite that soft, but improved pastures are now found all over Florida and are proving that they are the most profitable use to which large acreages of land can be put.

Soil Aeration . . . . Fertilizers

(*From page* 12)

Midwest Agriculturist for the American Cyanamid Company, on October 7, 1947. While making dozens of soil profile studies during the day in Illinois in various fields showing the typical symptoms of compacted-soil troubles as shown in Fig. 1, and with invariably the same conclusion, we came upon the uncommon situation where one good-looking field of healthy corn plants was next to another field showing the tight soil difficulties of root-rotted and lodged plants. In this State where the ratio of one acre of deep-rooted legumes to 16 of corn exists, this combination was really worthy of study. The soil profiles and corn stalks shown in Fig. 7 tell the story. Tight soil to the plow depth and poorly developed, rotted roots were in the field to the left. Good porosity and tilth in the sample to the right provided the better soil environment for healthy roots and vigorous plants.

Dr. Boyd then visited the grower of the better field, Ben Apke, on Route 119 about eight miles west of Rantoul, Illinois, and got the cropping history of both fields. Three years of good alfalfa preceded the corn in the better field, and a red clover pasture preceded the poorer corn. The compacted soil in the corn field following red clover sod convinced all of us of the superiority of alfalfa as a tilth-improving crop. The same weather conditions affected both these fields this year. The conclusion is too good to omit: Had more soils in the Midwest been in better tilth the damage to the corn crop attributed to wet weather, drought, and root-rots would have been greatly reduced in severity.

Discussion

Numerous other case histories could be cited to expand this story. The evidence is conclusive and points to the need for more deep-rooted legumes in the rotations in the states showing the widest ratios of acreages planted to deep-rooted legumes and corn. The

opportunities for more studies on soil and plant interrelations are great, and the efforts of graduate students in agronomy should be directed to these problems. The fundamental importance of adequate oxygen for root respiration and nutrient absorption has received consideration recently by Lawton,[1 2] Smith and Cook.[3] These workers have duplicated field soil compactions in greenhouse studies with corn and sugar beets. The cultures were fertilized in various ways and both aerated and non-aerated pots at different moisture levels were used to study the effects of the soil compactions on the growth and composition of the plants.

Further studies should be made with corn hybrids to determine definitely what the critical conditions are when the aeration, moisture, and nutrient supply factors predispose the roots of these plants to infection by the common root-rotting organisms. Field observations showed clearly that the roots were less affected under the soil tilth conditions following deep-rooted legumes this year. One of the most common organisms causing root rots of corn this year was the wheat scab fungus, *Gibberella saubinetti*. Tons of this inoculum are widespread and if favorable conditions of wet weather and temperatures prevail next spring, the wheat crop may have an unwelcome visitation of scab troubles. If this should happen, the effect of the soil compactions in 1947 might interest the plant pathologists.

Further, the soil physicists should find it interesting to determine all of the factors involved when the repeated pulverizations of clay soils by rubber tires, plows, discs, and other friction equipment contribute to the soil compactions which develop by eluviation. The soil chemists should also adjust the interpretation of the commonly used soil tests for making recommendations for the use of fertilizers to include the soil structure-tilth conditions under which the crops will be grown.

Thus it is seen that the current status of compacted soils, especially the clay soils with low organic matter contents, needs the attention of all groups interested in soil fertility conservation and crop production. This field for research remains wide open and attractive from the standpoint of practical agriculture. The case histories reported herein support these last statements.

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(3) Smith, F. W. and Cook, R. L. *Sugar beets require adequate soil aeration.* Better Crops With Plant Food, March 1947.

Pasturing Cattle in Tung Orchards

(*From page* 14)

grazing in November, December, and January. By removing the cattle, the oats can be harvested for grain in May. This same land can be used for Alyce clover or other legume hay crops during the summer months and is good insurance for a successful cattle production program.

Some of the larger orchardists, particularly in St. Tammany Parish, are doing only a limited amount of grazing because of summer cultivation of tung orchards and the extra work involved in shifting stock from one part of the orchard to the other. However, according to County Agent W. P. Knight of St. Tammany Parish, all of them are continuing to graze to some extent.

The Management of Mint Soils

(*From page* 20)

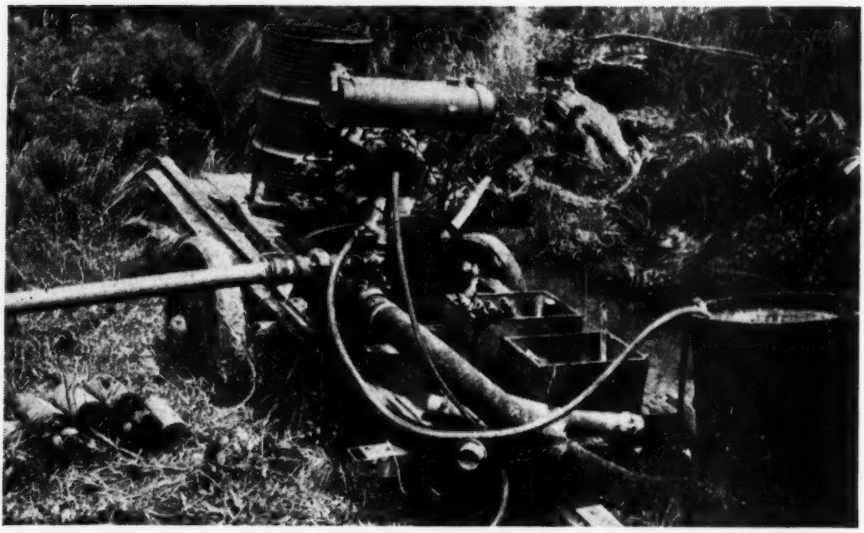

Fig. 6. Soluble fertilizer is drawn through here into suction side of irrigation pump for application through sprinklers.

mint leaves and other plant parts have been made. These are summarized in Table 5. Leaf samples taken in June contain more potash than those collected in August. Rate of application of potassium is reflected in increased leaf potash. Potassium content appears to be higher in stems than in blossoms or leaves. Scorched leaves from plots without potash fertilizer contained one-third the amount of potassium that was found in leaves from plots where a medium amount of potash had been applied in the fertilizer.

Production of mint oil of high quality and adequate tariff should protect from ruinous foreign competition.

Further study is needed of fertilizer, rotation, and irrigation problems, use of spent mint straw, control of weeds and pests, and mechanical facilities for quick, clean distillation.

Do Soybeans Cause Clover Failures?

(*From page* 24)

bus, Ohio, in 1946, hay yields from all treatments as well as different seeding methods averaged slightly higher on soybean ground than on corn ground with the legumes sown in either wheat or oats.

The Agricultural Experiment Station at Lafayette, Indiana, set up a project to study the effect of soybeans on subsequent legume crops, mainly red clover and alfalfa. The part dealt with here was designed especially to determine whether applications of lime and fertilizer will equalize stand and yields of clover seedings in small grains following soybeans and corn.*

In 1944 and 1945 a number of com-

* This research was made possible by a fellowship grant from the Central Soya Co., Fort Wayne, Indiana.

parative tests were placed with farmers throughout Central Indiana where most of the complaints originate. In all cases comparisons for legumes were provided by locating these tests in fields which in the preceding season had been partly in soybeans and partly in corn. Care was taken in selecting fields where the seedbed preparation for the companion crop was identical regardless of the preceding crop. A special effort also was made to choose fields high enough in lime content to guarantee legume growth and so to eliminate one of the most common and sorely neglected causes for clover failures.

In spite of the fact that in nearly all tests the corn preceding the small grain was fertilized while the soybeans were not, differences between available P_2O_5 and K_2O respectively after corn and after soybeans were almost non-existent according to test. (Table IV)

Two rates of fertilizer (400 and 800 pounds of 0-12-12 per acre), with and without additional lime as well as lime alone, were applied on replicated plots laid out at right angles across the soybean and corn strips. For seedings in winter wheat the treatments were applied as top-dressings in early spring previous to the sowing of the legumes. In preparation for oats, fertilizer and lime were disced in lightly before seeding. Rainfall was short during most of 1944 and the severe drought during midsummer proved damaging to all crops. It was especially severe on clover and, as evidenced by stand counts, affected legumes after soybeans more than after corn. Clover stands on soybean ground were about 25 per cent poorer in oats than in wheat. This

TABLE V.—RESULT OF CLOVER FERTILIZATION TESTS ON SOYBEAN AND CORN GROUND. YIELD OF LEGUME HAY IN POUNDS PER ACRE (COMPANION CROP—OATS)

Average of 5 tests 1944–45 and 1945–46

Treatment	After Soybeans lbs./acre	After Corn lbs./acre	Increase After Soybeans lbs./acre
No treatment*	3,380	3,309	71
Lime only	3,708	3,553	155
400# 0–12–12	4,321	4,217	104
400# 0–12–12 +lime	4,449	4,255	194
800# 0–12–12	4,782	4,441	341
800# 0–12–12 +lime	4,959	4,661	298

Companion Crop = Wheat

Average of 5 Tests 1944–45 and 1945–46

Treatment	After Soybeans lbs./acre	After Corn lbs./acre	Increase After Soybeans lbs./acre
No treatment*	2,967	2,608	359
Lime only	2,702	2,696	6
400# 0–12–12	3,117	3,061	56
400# 0–12–12 +lime	3,081	2,963	118
800# 0–12–12	3,534	3,309	225
800# 0–12–12 +lime	3,229	3,115	114

* "No Treatment" disregards whatever over-all fertilization has been applied to the companion crop.

TABLE VI.—INFLUENCE OF LIMING ON THE UPPER TWO INCHES OF SOIL

Treatment	None		Fine Lime	400 lbs. 0–12–12 + Lime	800 lbs. 0–12–12 + Lime
	Plow Depth 6″	Upper 2″	Upper 2″	Upper 2″	Upper 2″
	pH	pH	pH	pH	pH
Wright Farm.....	5.1	5.5	6.1	6.4	6.7
Gerke Farm.....	6.7	6.9	7.4	7.4	7.3
Heiman Farm.....	6.5	6.7	7.5	7.5	7.5

is believed to be due to looseness of the soybean ground.

Average rainfall during the winter of 1944-45 and an ample, well-distributed supply of moisture in a relatively cool summer created favorable conditions for the establishment and development of clover seedings in 1945.

A total of ten tests (five in wheat and five in oats) was harvested in 1945 and 1946. As customary in Indiana only one cutting was made of clover and two of alfalfa with the fields then generally left for pasture. With the exception of one test in wheat where the yield of clover was substantially reduced by anthracnose in the spring of 1946, there was no noticeable loss through diseases or insects.

The results of these tests (Table V) show that legumes following soybeans have outyielded legumes following corn by an average of 170 pounds of hay per acre regardless of companion crop and fertilization.

With increases of over 800 pounds of hay per acre for the first 400 pounds of 0-12-12 and additional increases of about 500 and 300 pounds per acre on soybean and corn ground respectively for the second increment of fertilizer, the treatments have done reasonably well in oats considering that only in one test two cuttings of alfalfa were taken.

In the wheat tests the yield increases were considerably smaller with only about 300 pounds of hay per acre for each of the two fertilizer increments.

The effect of the fertilizer on the yield of hay was about the same whether the legume followed soybeans or corn. The method of application, however, made a considerable difference. Discing the fertilizer in, though only slightly, as in preparation for oats, was far more effective than top-dressing without further mixing with the soil.

Liming had little effect on the yield of hay because, especially in 1945, most test fields were for all practical purposes high enough in lime to warrant the growing of clover. When disced in in preparation for oats, the application of lime usually increased the amount of hay slightly in comparison with the corresponding unlimed plot. But when fine lime was top-dressed on wheat in amounts calculated to bring the surface soil up to an only very slight acid reaction, which required from 500 to 2,000 pounds per acre, yield depressions of varied magnitude were experienced.

The change in soil reaction by liming wheat following soybeans is shown in Table VI. The reaction of the test fields as represented by the untreated plots was determined in January 1945 before the lime was applied. The determinations from the upper two inches of the limed plots were made at harvest time in June 1946. In each of these tests the hay yield from the limed plots was lower than the unlimed plots. Likewise ground limestone applied to the surface of the soil on permanent

pastures in Indiana was found by Mott to have reduced yields in some cases as much as 10 and 15%.[8]

The reduction of clover yields in these cases is probably due to the depressing action of lime upon the availability of soil nutrients. Pierre and Browning as well as others have found the injurious effect of overliming associated with a disturbed nutrition of the plants, mainly with phosphate.[9] However, soil tests of our clover tests and of the earlier pasture tests did not show any marked difference in available phosphorus and potassium between the limed and unlimed plots.

Considering the data from all the tests presented here, it is evident that the claim of the adverse effect of soybeans on subsequent legume crops cannot be generalized.

Additional work on the subject of clover failures following soybeans is still in progress. Besides continuing fertilization tests, a study of the influence of soybeans, corn, and an alfalfa-brome grass mixture on the physical and chemical properties of several important Indiana soils and on the growth of subsequent legumes is under way. Furthermore, different tillage methods are compared in order to determine which practice will improve the physical condition of the soil after soybeans so as to give subsequent legumes the best start. In addition, the growth and yield of various legume species sown in wheat and oats on soybean and corn ground are carefully checked in several tests.

In the meantime most disappointments in stands and yields of legumes in rotations with and without soybeans can be avoided by providing conditions suitable for their growing. Main requirements are sufficient plant food and lime, a firm seedbed, and the proper use of reliable, inoculated seed. With favorable weather and in the absence of insects and diseases, which unknown and unnoticed by the farmer can take a heavy toll in legume seedings but should not be confused with poor soil condition, clover failures should be sharply reduced.

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Yours for Yuletide

(*From page* 5)

for Christmas morning. Young voices and pattering feet will be your reveille."

Then as the years pass and the youngsters vanish from your sphere and perchance a slightly larger revenue is yours to use, the chance once more arrives to brighten some other Christmas home in memory of bygone family tapers. For

this is the period in which the awful figure of Old Scrooge stands watchful guard against your natural inclination "not to be bothered."

Whether the doors of Home Sweet Home be wreathed in roses or sparkling with icicles on December 25th—it's the only fit place to be as the curtain rolls down on another long year of striving.

IT'S THE PLACE to be lazy without self-condemnation. It's the place to read old dog-eared childish books and to poke through old boxes of keys, mibs, jackknives, and stamp collections. It's the place to smile at Mother once more for just awhile, or else to hunt up her faded picture in the walnut dresser and lovingly smooth the quaint patch-work quilt, stitched by patient fingers, long since quiet and at peace.

It's returning to the old gate, yearning for the old dog at the empty kennel, beckoning to old chums now too fat or fashionable to follow you. It's listening to the rasping chimes of the family clock as you doze off in the little bedroom with the dormer windows—trying to believe in fairies and to banish the bogies. (Just as you have been doing so often these forty years since.)

It's awakening to the creak of wagon wheels on the frosty snow, the blessed batter cake aroma; and to listen in vain to hear Father at the staircase calling cheerfully, "Time to get up, Buckshot!"

Consulting my Mother's penciled diary, I find evidence that for her Christmas began along in gooseberry canning time the summer previous and continued unabated through autumn evenings, as long as there was kerosene to light the lamps to sew by. To be sure, she didn't say so right out loud, but a fellow who lived with her and noted her objectives is able to read into that old diary a heap more than her brown penny pencil ever dreamed she had up her sleeve.

I guess all good Mothers with healthy, careless families are like that; and my wife's own habit of never sitting down idly with empty hands proves that the best American women of all generations eternally think of the present in terms of future comfort and preparedness.

Mother's kitchen was needlessly large, and the floor uneven and hard to keep clean. Water for cooking and dish washing had to be carried from an outer well and a cistern pump in the "summer house." Too often we forgot to fill the pails or split the kindlings. Cooking was done over a low, cast-iron stove, with a sagging oven door and no thermometer, the pipes bubbling with creosote at joints and chimney piece. Every week or oftener the greasy coal-oil lamps had to be refilled and the chimneys washed and polished. The parlor hanging lamp, with its purple bowl and crimson shade, circled with glass pendants, must receive the once-over. Chunks of firewood thumped down on the "zinc" mat near the heater left more litter and dust to be gathered up. Our dogs were forever nosing and tracking in and out; and our closet floors held more duds than the wall hooks intended for them.

Yet somehow, out of the dear past, I cannot recall ever hearing Mother bewail her lot in life, even when all she got out of Christmas was the things she sacrificed to give to us.

AFTER A LONG DAY'S trudging and bending, she would stand at the threshold of the "sitting room" pushing her dark hair away from a flushed and tired face, and remark "how nice and cozy it is to come in here and do my darning by the fire, with all my family around me." Maybe at this point some of us would grab away her work basket and hand her a library book to read aloud, because she had such a rich, soothing voice, and she would stop and sniffle with us at the sad parts of Tiny Tim or Little Nell.

And one winter she had Father search the woods for spruce boughs and sewed them neatly on cardboard cut-

out letters made to spell "Merry Christmas at Home." That was the same year I gave up my faith in Santa Claus; but sensing that I was the last one of the clan to retain that tradition, and the youngest, I hung up my home-made knits behind the base-burner, just to please my Mother once more.

MY FATHER was denied a bookish education, but he wanted us kids to have a few books at Christmas, which he picked out himself. As I think it over now and recall the ones he gave us, it seems he must have had a little help from Mother. On my shelves today are a few leftovers from boyhood fiction favorites. Here is one of them, bound in faded red, with coarse, thick brown leaves, bearing the title, "Tanglewood Tales from Hawthorne." On the flyleaf in Mother's hand it says, "Christmas 1900, from your Father, with Best Wishes." But on the back inner cover is left a tiny pasted label, "I was bought at the Fair Store," with a dim notation by the clerk, "25 cents."

Pray, after all, what was 25 cents if you wanted to give your kid a pretty good book for Christmas? You wouldn't miss it six weeks later. Since then on many occasions I have met those same heroes of Hawthorne's classic fable, dressed in finer garb and presented in nobler folios. Yet the Golden Fleece, the greedy Minotaur, and Ulysses and the crafty sirens have never stepped forth in more dramatic pageantry than they did upon our first acquaintance in that little book at Christmas more than forty years ago. So you also may bear similar witness, my friends, that the gift without the giver is bare; and that the old, the simple, and the tender things remain the longest and leave us fully satisfied.

Yes, and I had a brother, too, a lad grown up and gone from home, who purchased sundry books of high adventure and made me conversant with the noble and the just and great. Valued in terms of edition or of style, none of these ranked high; but I knew he had to skimp himself a trifle to make them mine. These and a limp leather Testament presented to me by a neighbor lady are at the bottom of a storage box, waiting to be read some day again—I hope as thoroughly and potently. Of such were our common family experiences.

All this was our mutual heritage, our joint privilege for many a holiday interval we have shared in this best land of all lands, trying our best to translate it into peace and joy forevermore.

Amid much wrangling, much bitterness, and kindred suspicions we of the country that granted us so many pleasant Yuletides carry at bottom nothing but good will and hearty respect for the basic needs and yearnings of mankind for better and wiser ways of living.

Most of us here in the United States are people who have little to do personally with the tragic forces that direct our fates. Just as the farmer plows and prepares the soil for a hopeful harvest and plans to do his humble part in a spot of small world-wide consequence, so the majority of us without real power to achieve peace and good will beyond our local zones intends to uphold that domestic tradition.

WE HAVE SEEN that heart's desire falter and fizzle out in the wake of remorseless greed and thirst for power. Some of us have even offered human sacrifice on such pagan altars. But we did it in fond hope that this would be the last of sordid sorrows and useless misery.

Religion means different things to different people. Ours happens to be one of simplicity and peace, devoid of vainglory and selfish lust. Yet somehow certain other landed leaders choose to regard us as interlopers instead of kindly helpers; as connivers for corruption instead of "eager beavers" for justice and fair play.

But regardless of creeds and national systems, I have felt that folks all over the world were striving hard for much the same goal. This goal is probably envisioned in other religions than ours, but it has a very plaintive and human attribute—that some good must come to folks on earth, and not all be saved up to reward achievers of the life to come. If I could play a harp I'd like to begin my lessons here, and not postpone the symphony until I sprouted wings. If I could do some good I'd like to do it now—I fear the angels will not need my kind attention. (And if assigned elsewhere, I wouldn't have the courage or the opportunity.)

JUST IN THIS WAY, the Christmas season is dedicated to sweetness and light. In our pursuit of such ideals we must be set to music allegro, with cheerful song and time out for warmth and jest. For this is part of the new picture we hope to paint on a large world canvas, and the realm in which the world wants to dwell. Any other mode of approach is fatal, because it smacks of the dungeon and the prison camp, the woes of war and the fears unknown.

Dour, long-faced, solemn, and foreboding faces have too long reigned and spread disaster. If all we can offer is more harsh discipline, more sacrifice, more dumb acquiescence in half-baked doctrines, then all we have learned at Christmas is just so much lost effort.

So poke the fire, light the candles, and enjoy the fullest of the season's cheer. But do not draw the shades or bar the door, for if there was ever a time to let our lights so shine before men upon the snows of despond, this is the hour.

My heartiest wishes for readers of BETTER CROPS WITH PLANT FOOD is a world-wide program to uphold the *principles* of Christmas, even if all of the population doesn't believe in Santa Claus.

Time Proven LaMotte Soil Testing Apparatus

LaMotte Soil Testing Service is the direct result of 26 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils, and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

Methods for the following are available in single units or in combination sets:

Ammonia Nitrogen	Iron
Nitrate Nitrogen	pH (acidity & alkalinity)
Nitrite Nitrogen	Manganese
Available Potash	Magnesium
Available Phosphorus	Aluminum
Chlorides	Replaceable Calcium
Sulfates	

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.

LaMotte Combination Soil Testing Outfit

Standard model for pH, Nitrate, Phosphorus and Potash. Complete with instructions, $35.00 f.o.b. Towson, Maryland.

Illustrated literature will be sent upon request without obligation.

LaMotte Chemical Products Co.

Dept. BC Towson 4, Md.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)

Reprints

N-9 Problems of Feeding Cigarleaf Tobacco
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What Is the Matter with Your Soil?
II-12-42 Wartime Contribution of the American Potash Industry
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
A-1-44 What's in That Fertilizer Bag?
H-2-44 Efficient Fertilizers for Potato Farms
AA-8-44 Florida Knows How to Fertilize Citrus
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—the Aristocrat
DD-5-45 A Case of Combined Potassium and Boron Deficiencies in Grapes
GG-6-45 Know Your Soil
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
TT-10-45 Kudzu Responds to Potash
ZZ-11-45 First Things First in Soil Fertility
CCC-12-45 Poor Soils—Poor People
H-2-46 Plow-sole Placed Plant Food for Better Crop Production
S-4-46 Plow-under Fertilizer Ups Corn Yields
T-4-46 Potash Losses on the Dairy Farm
W-4-46 Muck Soils Produce Quality Sweet Corn for Canning
Y-5-46 Learn Hunger Signs of Crops
AA-5-46 Efficient Fertilizers Needed for Profit in Cotton
BB-5-46 The Soil Is Our Heritage
HH-6-46 Mistakes Versus Essentials of Pond Management for Fish
II-6-46 Pastures in Mississippi Produce Profits
NN-10-46 Soil Testing—A Practical Aid to the Grower & Industry
OO-10-46 Soil Aeration Affects Fertilizer Needs
WW-11-46 Soil Requirements for Red Clover
XX-12-46 Farm Mechanization in Relation to Cotton Quality and Marketing
YY-12-46 How Guernsey Calves Helped Solve a Feed & Crop Fertilization Problem
ZZ-12-46 Alfalfa—A Crop to Utilize the South's Resources
A-1-47 Fertilizing Vegetables by Applying Fertilizer to Preceding Cover Crop
B-1-47 The Use of Dipicrylamine in Tissue Testing for Potash
D-1-47 Good Pastures Conserve and Pay
G-2-47 Research Points the Way for Higher Corn Yields in North Carolina
H-2-47 Large Grasses for Pasture
I-2-47 Fertilizers and Human Health
J-2-47 Yields Tell the Story
K-2-47 Potash Pays for Peas at Chehalis, Washington
L-3-47 Sugar Beets Require Adequate Soil Aeration
M-3-47 The Role of Major Elements in Plant Nutrition
N-3-47 Efficient Management for Abundant Pastures
O-3-47 Increased Quality of Products Is Answer to the Problem
P-3-47 Year-round Grazing
Q-4-47 Fertilizers for Sugar Beets
R-4-47 The Effects of Fertilizers on the Blackland Soils of Texas
S-4-47 Rice Nutrition in Relation to Stem Rot of Rice
T-4-47 Fertilizer Practices for Profitable Tobacco
V-4-47 Don't Feed Alfalfa at the "Second Table"
W-4-47 The Search for Nutrient Deficiencies in Farm Crops
X-5-47 Potato-growing Developments in New England
Y-5-47 Increasing Grain Production in Mississippi
Z-5-47 Building and Maintaining Good Lawns
AA-5-47 The Potassium Content of Farm Crops
BB-5-47 More Palatable Grass Is More Nutritious
CC-5-47 Ten Years of Soil-building in Vermont
DD-6-47 Profitable Soybean Yields in North Carolina
EE-6-47 The Wheelocks of Vermont Grow Grass
FF-6-47 Community Cooperation in Soil Conservation
GG-6-47 Corrective Measures for the Salinity Problem in Southwestern Soils
HH-6-47 Determining New and Better Fertilizer Ratios
II-8-47 Whole-farm Demonstrations
JJ-8-47 Analyzing the Soils of Northwest Louisiana
KK-8-47 Minor Plant Nutrients
LL-8-47 Reshaping New England Farm Land
MM-8-47 Fertilizing Potatoes Economically in Aroostook County, Maine
NN-10-47 Let's Replace Guessing with Soil Testing
OO-10-47 From Broom Sedge to Beef Cattle
PP-10-47 Potash Fertilization of Alfalfa in Connecticut
QQ-10-47 Fertilizer Placement for Corn on Sandy Soils of Minnesota
RR-10-47 Urine Spots Reveal Soil's Deficiencies
SS-10-47 Soil Fertility and Management Govern Cotton Profits

THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

Samuel Hopkins Adams, who was always willing to try anything once, had accepted an invitation to a nudist party. Describing the experience to some friends the next day, he said, "They certainly didn't do things by halves. Even the butler who opened the door for me was completely nude."

"If he wasn't uniformed, how did you know it was the butler?" asked Mr. Adams' literal-minded publisher.

"Well," said Mr. Adams, "it certainly wasn't the maid."

* * *

Mose was brought up for the fourth speeding offense. He muttered under his breath something that sounded a lot like an oath.

"Repeat that!" snapped the judge.

"Ah says, God am de jedge, God am de jedge!"

* * *

TOO BAD

A man hitched up the family nag and took his daughter for a drive. At a lonely stretch in the road, a masked bandit held them up. The man barely had time to whisper to his daughter, "Hide your diamond bracelet in your mouth."

The bandit took everything they had and drove off in the gig, but he never found the bracelet. When he was out of sight, the father observed, "It's too bad we didn't bring Mama. We could have saved the horse and buggy."

* * *

Most women would be more spic if they had less span.

A motorcycle cop pulled up beside a parked car on a country road in the wee small hours of the morning.

"Hey," he yelled, "what business have you got to be out here at this time of the night?"

"This isn't business," came a voice from within, "it's a pleasure."

* * *

A minister was riding on a train when a big, strapping rough fellow came in and sat down beside him. Sizing up the prelate, he exclaimed, "Where in hell have I seen you before?" to which the minister replied, "I don't know; what part of hell are you from?"

PREMATURE

Young Bride: "That baby tonic you advertised—," she began, "does it really make babies bigger and stronger?"

Druggist: "We sell lots of it, and we've never had a complaint."

"Well, I'll take a bottle."

In five minutes she was back. "I forgot to ask about this baby tonic, who takes it—me or my husband?"

* * *

Rastus (throwing down four aces): "There, guess I win this ole pot, all right."

Sambo (angrily): "You play this game honest, boy; play it honest! I know what cards I dealt you!"

* * *

Doctor: "You must avoid excitement."

Bachelor: "Oh gee, Doc, can't I even look at 'em across the street?"

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

PACIFIC COAST BORAX COMPANY

NEW YORK CHICAGO LOS ANGELES

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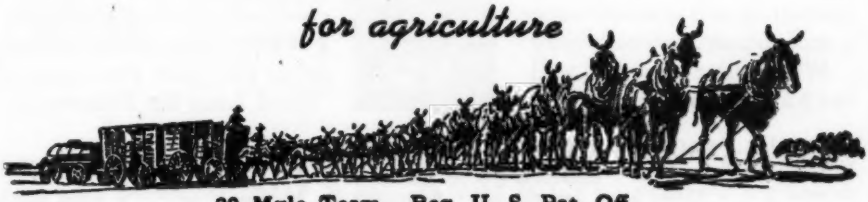
for agriculture



20 Mule Team. Reg. U. S. Pat. Off.

Make your own GOOD LUCK!

Would you like to know the secret of catching a nice "mess" of big fish every time you "wet a hook" in your favorite pond?

The secret is *plankton algae!* All the fish in your pond depend, directly or indirectly, on plankton algae for food. They either eat plankton algae, or eat animal and insect life which exists on plankton algae, or eat other fish which eat plankton algae.

Plankton algae is a tiny water plant, so small it cannot be seen by the naked eye. But you can tell when plankton algae is present in sufficient quantities, as it gives the water a greenish or brownish color.

When your pond is well-managed and properly stocked with fish and the water supports an abundant growth of plankton algae, you always have good fishing luck. Like other plants, plankton algae requires plantfood for abundant growth. By adding fertilizer to your fish pond, you increase the growth of plankton algae and thus supply the food needed to grow more fish and bigger fish.

Virginia - Carolina Chemical Corporation has been a leader in the manufacture of better fish-pond fertilizers for many years. In growing crops or growing fish, make your own good luck: *Use* V-C *Fertilizers!*

FREE: *Write to the address below for your free copy of* "Good Luck for Fishermen."

VIRGINIA-CAROLINA CHEMICAL CORPORATION

Richmond, Va. • Norfolk, Va. • Greensboro, N. C. • Wilmington, N. C. Columbia, S. C. • Atlanta, Ga. • Savannah, Ga. • Montgomery, Ala. Birmingham, Ala. • Jackson, Miss. • Memphis, Tenn. • Shreveport, La. Orlando, Fla. • E. St. Louis, Ill. • Baltimore, Md. • Carteret, N. J. • Cincinnati, O.

VC FERTILIZERS

Make the good earth better!

SERVING THROUGH SCIENCE

NEW CHEMICALS
TO OVERCOME
FUNGI-INSECTS-WEEDS

☑ *Check the pest you want to Control!*

SEED DECAY AND DAMPING-OFF OF PEAS, BEANS, LIMA BEANS AND CORN—Use Spergon seed protectant. It makes reduced planting rate possible with stronger stands, higher yields.

DOWNY MILDEW OF CABBAGE—Use Spergon (Wettable) as a spray or dust. It is widely recommended by leading authorities.

LEAF BLIGHTS AND ANTHRACNOSE OF TOMATOES—Use Phygon (Wettable) as a dust or spray. It gives economical control and increased yields.

SEED DECAY AND DAMPING-OFF OF BEETS, SPINACH, TOMATOES, PEPPERS AND SWISS CHARD—Use Phygon seed protectant. It is outstanding for these crops.

ANTHRACNOSE OF BEANS CAN BE CONTROLLED—Use Phygon as a seed protectant, followed by Phygon (Wettable) as a spray ten days after emergence. Don't lose your bean crop this year now that an effective control is available.

CORN BORER AND THRIPS—Use Syndeet-S-30. This is an oil solution containing 30% DDT for making emulsion type sprays. It has given effective economical control in field applications.

APHIDS, EUROPEAN RED MITES AND CODLING MOTH—Use Syndeet-30. At economical dosages, it gives commercial control of these orchard pests.

APHIDS, COLORADO POTATO BEETLES, LEAF HOPPERS AND FLEA BEETLES ON POTATOES—Use Syndeet-30. It gives control with a labor-saving reduction in the number of sprays required. Syndeet-30 is compatible with Bordeaux mixture.

WEED CONTROL—Use Tufor-40, Tufor-70 and Tufor-E. These formulations of 2, 4-D meet selective weed control problems.

EDIBLE VEGETABLE INSECT CONTROL—Use Syntone—a fortified rotenone emulsion.

These recommendations are made on the basis of authoritative field trials by leading plant pathologists and entomologists.

Write for technical data sheets covering your specific problems.

New Scientific Developments of Agricultural Chemical Division

UNITED STATES RUBBER COMPANY

1230 Avenue of the Americas • Rockefeller Center • New York 20, N. Y.

THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

American Potash Institute
1155 Sixteenth Street
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